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THERAPEUTIC EXERCISE: A NEGLECTED METHOD IN PHYSIOTHERAPY*

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IF by physiotherapy we mean "natural methods of healing," and keeping the body in health, it becomes apparent that certain distinct and rather well defined means are to be employed. LIGHT, and its attendant force, HEAT, is perhaps the most common. Ever since God said, "Let there be light," and the ancient historian remarked that "the light was good," we have had no cause to change our opinions of its beneficent effect on animal and vegetable life and growth. We may say, then, that heat and light are certainly to be included in our physiotherapeutic measures. In the most ancient of books we are told that "the voice of thunder was in the heavens; the lightning lightened the world." So electricity is no new thing. Only recently have we harnessed its power, modified its currents and used it in medical and surgical practice. It is a potent therapeutic agent. Our knowledge of its application

and indications, as well as contra-indications, is increasing day by day. Oftentimes we stress its use to such an extent that in the minds of some PHYSIOTHERAPY means ELECTROTHERAPY. This is a too narrow conception of the term physiotherapy. While electricity is undoubtedly valuable and essential, it is only one member of the physiotherapeutic family. Another is HYDROTHERAPY, of ancient usage and one of nature's methods, surely. Its value cannot be denied; its uses are varied and beneficent.

Quoting again from an ancient book, we are told that at the very beginning of his existence man had to live "by the sweat of his brow." Thus in the primal days of his existence, exercise became essential for man's very life, not only economically, but physically as well. It is to this phase of physiotherapy that I want to call your attention—a neglected phase. All of us real-

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ize the necessity for exercise if there is to be vigor and the proper functioning of the organs of the body. Perhaps we do not so keenly recognize the values of certain specific exercises and their therapeutic values in the correction of bodily deformities, poor posture, spinal deviations, flat feet, and even in certain cardiac disorders. Perhaps we do not always have clearly in mind the prescription of exercise, regulated as to dosage, character, frequency and duration. To my mind this is clearly an important physiotherapeutic agent. Is it not true that generally the physician tells his patient to "take some exercise," without specific directions? Surely he does not tell him to go to the drug store, and get some medicine, and leave him with this meager and incomplete advice!

Under the heading of EXERCISE I shall include massage, with its varied tapping, rubbing, stroking and kneading movements, a passive form of exercise, but in many respects similar in its effects to active exercise.

Physical exercise is directly concerned with bodily movements and the tissues and mechanisms are concerned in those movements. These tissues are the bones which act as levers and support, the muscles which move the bones, the nerves which supply the muscles, and the brain and central nervous system which are over and above all.

These latter tissues we term the neuromuscular system; physiologists call them the "master tissues." Our very lives depend upon the muscular movements of di-

gestion, circulation, respiration and excretion. We can easily see that the approximately 500 muscles of the human body, which make up about one-half of the body weight, play a large part in the human economy. Exercise is essential. Activity means life, vigor, efficiency and even happiness; inactivity means decay, degeneration, atrophy and disease.

I should like to call to your attention the words of Hall, who says: "We cannot fail to notice the immense amount of time devoted by nature to the development of the muscular system. Why did she linger so long over it, before going to the development of the brain, especially the cortex, with its mental powers? Evidently it must be of far greater importance, and have far larger latent capacities than we have usually supposed. In the brain the cortical centers for the voluntary muscles extend over most of the lateral zones, so that their culture is brain building."

In order that we may understand some of the physiological effects of exercise, let me first call your attention to the divisions of the muscular system into what we may term the "fundamental" and "accessory" muscles. The fundamental muscles are the big muscles of the body, of the trunk and legs, and large joints (hips, shoulders and knees), and which in general man has in common with the higher and larger animals. Their actions are few, mostly simultaneous, alternating and rhythmical; walking, running and trunk exercises generally may be cited as illustrations.

The accessory muscles are the smaller groups, such as the muscles of the forearm, hand, tongue, face and articulating apparatus. They are used for finely coordinated and exact movements, such as writing, talking, smiling and facial expression, playing musical instruments, and thousands of skillful movements of the parts concerned. They are the smaller and more numerous muscles; their functions develop later in life and represent a higher standpoint of evolution. They are chiefly associated with psychic activity, which plays upon them by incessantly changing their tensions, if not causing active movements. General paralysis usually affects these accessory muscles first.

The central and fundamental muscles are older than the peripheral or accessory. But each group of muscles, of trunk, shoulder, upper or lower arm, or leg, has its own centers of control. The fundamental muscles of the trunk, shoulder and thigh are capable of few movements, and these neither complex nor precise. The muscles of the hand, and especially of the fingers, are capable of a great variety of combination of movement. Hence centers controlling the fundamental muscles are comparatively simple, composed of a few cells with simple combinations. On the other hand, the centers controlling the accessory muscles are composed of a larger number of cells; the center is more complex.

The fundamental centers, like their muscles, are older, tougher and of greater endurance; the younger centers of the acces-

sory muscles are not only more delicate, but weaker and more easily exhausted. Thus in our prescription of exercise, we should first of all give those movements which call for big muscle activities. Nature's effort to develop these fundamental centers has been called the "struggle for a constitution." They are the seats of endurance which enable us to hold out against the strain of modern life, especially in the hurry and stress of our great cities. In the child, these muscles must be strengthened at all cost. He must be given opportunity for their full development in his running, dodging and "tag" games, and in the instinctive activities of childhood. These activities are fundamental in his education; indeed, they are education itself. Hall says that if these activities are neglected, the older fundamental centers will be incompletely developed, the whole brain structure totters, or collapses. In late childhood or adolescence, we can develop the finer powers. School and kindergarten often lay a disproportionate strain on the tiny accessory muscles that wag the tongue, move the pen and do fine work requiring accuracy. Brain and muscle are never divorced in the action of healthy animals or healthy men. They should not be divorced in the education of the child. "God has joined them together; let not man by any artificial system put them asunder."

After the development of the fundamental muscles and their brain centers, nature seems content to lessen the desire and the need for exercise; and yet all through life this need exists. We simply vary the char-

acter and the extent of our exercise. The forms of exercise, then, vary according to age. The adult does not need the incessant activity for which the child has such a strong and wholesome instinct. The normal life of the child is one of almost steady activity during the waking hours. We are taking away for five hours a day a large part of this activity, at the very time when it is of the greatest importance in the life and development of the child. Not only is muscular exercise decreased by school life, but pressure is brought to bear very largely on the nervous system, with evil results. What, then, is the remedy? Clearly, there should be frequent periods of relaxation, frequent school recesses, school room games and exercises, and playgrounds in every school, and opportunity to use them, under supervision.

Briefly, let us consider further some of the effects of exercise. When a muscle contracts, energy is expended; some of the higher complex cell constituents are broken down. There is combustion and the products of combustion, which must be removed. The muscle cell proceeds to absorb from the surrounding plasma additional food materials, particularly oxygen and carbohydrates. Thus muscular activity results in a constant change of some of the essential elements of the muscle cell itself, which is kept in a state of increased efficiency in proportion to its use. Both the number and size of the muscle cells are increased by exercise. The sarcolemma appears to be increased in strength. The growth in this part of the muscle, which is fibrous, is well

shown in the toughness of muscles taken from animals which are accustomed to severe and prolonged exercise, as compared with those which do not work so hard. The fibers are coarser and heavier, the tendons thicker and less yielding, the whole muscle harder and firmer.

Since the muscle cell absorbs oxygen and carbohydrates from the blood flowing through it, the blood itself is altered in constitution by exercise. Such blood, flowing through the lungs, causes increased respiratory movements. The lungs must supply more oxygen; hence the muscles of respiration are brought into immediate and vigorous action; the percentage of oxygen in the lungs is greater than usual.

The contraction of the muscle fibers squeezes the lymph vessels and the smaller veins, so that the blood and lymph are forced onward to the heart. The centers in the medulla are stimulated, causing increased cardiac activity. By these means the circulation of the blood is at once markedly stimulated, and the arteries supplying the muscles exercised are immediately somewhat dilated. We have thus a completely adjusted mechanism for augmenting food supply and eliminating waste. The greater consumption by the muscle cell of carbohydrates and proteins causes a general hunger for food. Hence the whole digestive tract comes into a state of increased activity.

Hence we see that through muscular exercise there is a strong effect upon all the

important functions of the body: respiration, circulation, nutrition, excretion and cell metabolism. Shall we not then call it a therapeutic agent, and since it is a natural one—a physiotherapeutic agent?

Let me now give you some hygienic principles of exercise. The first is, that contraction and relaxation should alternate. Static contraction is injurious; a period of rest and a period of work is the physiological rule; rest is as necessary as activity. In prescribing developmental exercises, changes from one muscular group to another should be made. It is a platitude to say that exercise should be out of doors whenever possible, and in the sunshine; but if we must do our exercise indoors, there should be abundant ventilation. Again, the best form of exercises should be pleasurable exercises, because of the added stimulus and zest, and the tremendous influence of the mind over the body. Exercise in company with pleasant companions is doubly beneficial. Feats of agility and strength should not be attempted before the blood is circulating freely and the muscles warmed up by moderate exercise. Each individual muscular effort should be well within the power and capacity of the performer. It should be relatively moderate. The dosage of exercise should be progressively increased; exercise should be taken daily and with regularity.

The prescription of exercise is too large a subject to be discussed at any length here. And yet I should like to urge its importance. What may be light work for one

may be over-strenuous for another. We must not forget the lessening demands for exercise as age advances, and that extremely rapid exercises are apt to be injurious to those of advancing age. In the middle period of life rapid running movements, or any long sustained straining exercise should be forbidden. Exercises of mild character, especially of a pleasurable nature, should be encouraged. For this reason games like golf are especially valuable. The mental interest in the game, the mild competition, the open air, the casting aside of business and professional cares, all make the activity a wholesome one. Walking is one of the best and most universally applicable exercises. It may be varied as to length, speed, duration and the nature of the roads traveled over. The automobile has seriously curtailed our opportunity and necessity for walking. We shall simply have to drag ourselves out for more exercise of this kind, or else there will be physical degeneration of serious nature, which no doubt will affect future generations. It seems to me the business of this body of men is to encourage all sane forms of exercise, and to insist that our patients, as well as ourselves, forcibly make opportunity, if necessary, for frequent periods of exercise and recreation. We shall live better, longer, more efficiently, more vividly and more happily, if we secure sufficient muscular activity, so necessary in this present distorted civilization of ours. Much of the physical and mental stamina of our sturdy ancestors in this country was due to their active and outdoor lives. Unfortunately, in a physical sense, we have

passed from these pioneering necessities to a life of physical inactivity, mental and nervous strain, and have sadly disturbed our equilibrium. Let us do our part to push the pendulum in the other direction.

Let us now consider some specific disorders; mention can be made of only a few, but in all of these exercise is demanded.

1. Excessive fat. Adipose tissue tends to accumulate from several causes, prominent among them being underoxidation, overnutrition and certain endocrine dysfunctions. Fat is first deposited over inactive muscles, like those of the abdomen, hips, neck, etc. Suitable and regular exercise tends to consume this unnecessary fat, but often the amount of exercise must be considerable, and pushed to the point of general sweating. Additional clothing, sweaters, etc., may be worn to facilitate perspiration.

2. Digestive disorders. Certain exercises, like long continued walking, running, etc., give a mild agitation and massage to the abdominal viscera, and facilitate digestion and elimination. Horseback riding is excellent in this respect. Peristalsis is hastened, and the muscular movements of digestion are aided. A weakened condition of the abdominal muscles is a frequent cause of ptosis; specific exercises for the muscles of the abdomen, front and laterally, are very useful, and should be practiced daily, and with some vigor.

3. Cardiac disorders. If there is absence of organic disease of the heart, and a simple weakness of the myocardium, progressive and regular exercises will prove of

great value. The heart, like any other muscle, improves and is strengthened by exercise. As a rule, the exercises should be rather sustained and slow in character, with gradual increase of dosage and speed of movement. The conditions are favorable if there is a slowing down of the heart beat to the normal fairly soon after the cessation of the active exercise, and when there are no uncomfortable after effects, such as nervousness, sleeplessness, etc. Of course every case must be watched with care.

4. Neuroses. Many nervous conditions seem to result from insufficient exercise. Moderate exercise, with a definite object in view, seems always beneficial. Walking in the open air and sunshine, moderate competitive games, like tennis, baseball, golf and exercise of that sort, as well as swimming, are very productive of good results. Long walks in pursuit of a hobby are exceedingly valuable, as in amateur photography, nature study (as birds, trees, wild flowers, geology, etc.), and should be encouraged at all seasons.

In addition, we may mention the good effects of walking and other activities on enlarged prostate. A sedentary life seems to add to this difficulty in middle aged and old men. More physical activity would be a boon to those so afflicted. In warding off arteriosclerosis, exercise plays an important part. Old age is thus really postponed. The physiologists tell us that "function makes structure;" we know that function helps also to maintain and preserve structure in healthful condition.

My contention, therefore, is that the prescription of exercise is a definite part of physiotherapy. I trust that you will see it in this light. The decree that "man shall live by the sweat of his brow" was not a curse—but a benediction.

DISCUSSION

Dr. Curran Pope (Louisville, Ky.): It is an interesting fact that I have proved to myself, through myself, that exercise will relieve fatigue. Any man who has been confined indoors for the larger part of the day working in his office, will get rid of his fatigue very much quicker by active exercise than he will by resting.

Some very interesting things occur. The doctor mentioned the influence of fear, of worry, as inimical to the value of exercise and hence the value of nutrition to the body.

I have at present in my hospital a case that had tried nearly everything that I know of, including nearly every form of physical therapy. She was a thin, anemic woman, generally run down, suffering from morbid fears. It was interesting, upon making a psychoanalysis, without even increase in exercise or increase in any form of treatment, to see how the betterment of the psychic state resulted in the gain of 22 pounds so far with an absolute change in the tone and the activity of the muscular system.

Personally I have experienced one thing of which the doctor spoke, and that is the accumulation of fat. I come by it by heredity, by good appetite, a digestion that never

knew a sick hour or day, and living in Kentucky where the sun shines brighter and the food's a little better and the liquids are all good. I found that it was not such a difficult thing to get rid of the fat, and I got rid of it, as the fair sex would say, in the right spot. I did this by giving up my automobile, by walking, by exercising moderately, and by abstaining from food, not changing the quality or the character of the food, but simply the quantity.

Those who do that will realize that they have increased their mental power and have developed their will in a way that will be very gratifying to them if they have the experience that I had.

That the strain of static exercise is well known and recognized in the theatrical profession I had occasion to learn several years ago from a female performer who posed in pictures. She came under my care, and she told me that it was far more straining to remain totally immobile for even short periods of two or three minutes than to take the heavy physical exercise and active training that she had to undergo to enable her to stand the static position of which the doctor spoke.

Personally, I believe walking is the best of all exercises, and after a little while anyone can learn to like walking, no matter where he may be going.

Speaking of cardiac cases, I shall never forget the interesting method of Sir Andrew Clark—a staircase treatment of heart cases. I have used that for years and years, grad-

ually strengthening the heart of patients by increasing the foot poundage of their work by allowing them to go down so many steps and come back up so many steps, and increasing the daily amount until the patient is able to go the whole flight, and then twice, and so forth.

We are all familiar with Schott's method. But it has always seemed to me that when we come to exercise we must remember one thing, that the brain worker should never over-exercise. The middle aged and the old man should never over-golf. If he is finding that the competition and the frequent beating that comes along with it is stimulating him to play too much golf, he must stop it or be made to stop it. If we have work and exercise in judicious alternation, we then get actually a correlation and a conservation of energy, just as nature wished us to.

Dr. J. C. Elsom: I simply want to give my approval to what Dr. Pope has so well said. In regard to the stair exercise, will you let me say this? Like all other forms of exercise, very much depends upon posture. If when we go up the stairs our heads are up and our chests are out and we contract the abdominal muscles, we get infinitely greater benefit from the particular exercise we are doing. With the students in the university I insist that posture is one of the most important things in the world. I think we perhaps wear ourselves out with improper posture more than in any other way.

In my office I have a lot of bricks. For certain forms of correct posture I place the bricks on the patients' heads. You can't stand in perfectly correct posture with a brick on your head. You know how perfect is the posture of the people we call heathen who carry burdens on their heads. That is some balancing stunt. I have seen magnificent specimens of those men and women carrying baskets on their heads in perfectly marvelous posture. I have even seen a colored man carry a watermelon on his head in perfect posture. I remember a colored friend of mine who used to go to the spring in the country and carry three pails with him. He filled the three pails, put the first one on his head, in his right hand took another, and in the left the third. When that man came walking up the hill he looked like a Greek god. His posture was magnificent.

Dr. Pope is perfectly correct in regard to static exercise. It is very much more difficult to maintain static position, it is a very much greater strain on the heart, on the nervous system, and time and time again I have seen a Freshman at the University fall in a faint during a drill period when they were all standing at attention. Even trained soldiers in the army faint and fall forward after standing at a position of attention for some time.

Only a few days ago I was reading of some soldiers in Europe who were required to stand at the head of the coffin of a dead potentate, and it was necessary for those men to stand precisely like statues without

even winking an eye. Do you know how long those trained soldiers could stand in that position? Only three minutes. Then there were relays of other soldiers who took the same position. It is the most exhausting thing in the world.

Let me emphasize again the proper periods of relaxation and contraction such as

we get in walking. We get those rhythmic movements which are very essential.

I hope the day will come when it will be against the law for us to ride in our automobiles all of the time. In fact, where I live the parking space is at such a premium that most of us have to walk anyway to get to and from our machines.

STATUS OF RADIOTHERAPY IN OPHTHALMOLOGY AND OTOLARYNGOLOGY*

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RADIANT energy, manifesting in forms commonly called heat, light, ultra violet and x ray, displays certain established effects that are recognized as serviceable adjuncts to medicine and to surgery. There is a sense in which the more pronounced and, therefore, better known effects may be looked upon as representing the "pharmacologic" properties of radiation. Heat, however produced, encourages hyperemia in the tissues which receive it. Light displays a similar quality. Air cooled ultra violet radiation affects the chemical functions of the tissues through various channels: one channel, apparently being through the activation of the cholesterol, and another channel being through the more or less specific stimulation which this energy shows for chromaffin-bearing tissues. Water cooled ultra violet is decidedly bactericidal. X

rays exert a resolving action on lymphadenoid tissue. Each region of the huge electromagnetic spectrum of which the portions which I have just separately enumerated form isolated parts, is capable of influencing the cellular units of the living machine; and the living machine is conceded today to have been created from the materials of the earth enchanted by the *solar* energy of the heavens.

Some of the dominantly obvious effects of radiation are of unquestionable value to the ophthalmologist and otorhinolaryngologist. There are definite instances, in fact, which seem to indicate that radiation offers to the clinician the quickest and surest route to remedy; yet, even in instances that superficially appear similar to the ones just intimated, radiation may not be as valuable as are older established practices. A case which has to do with the treatment of hay

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fever by means of air cooled ultra violet radiation, is recorded in the *Journal of the American Medical Association* by Novak and Hollender. If the clinical experience of those who have followed this work is at all similar to my own, then every otorhinolaryngologist has met with patients presenting hay fever whose etiology was not always clearly analyzable; and in this group, ultra violet radiation as applied by Novak and Hollender's method is as often attended with successful recovery as it is with complete failure. Naturally, this does not mitigate against the value of ultra violet radiation in the numerous instances where it does such splendid therapeutic work; but it admonishes us once more to be vigilant in safeguarding the progress of medicine by adding the new just as cautiously as we discard the old.

For the ophthalmologist, the powerfully active water cooled ultra violet radiation finds several splendid uses in the treatment of the various ocular and periocular tissues which become diseased. Various forms of blepharitis, such as blepharitis ciliaris, marginalis and ulcerosa, yield quickly to ultra violet influence. It is a simple matter to adapt a suitable quartz rod to the water cooled lamp; and, in a manner which may be described as "penciling," spraying the energy over the affected margins. The results are good.

Ultra violet radiation is absorbed by the conjunctiva, the cornea and the lens. At these sites of ultra violet absorption, reactions definitely follow and may be put to

clinical use. Granular conjunctivitis, or trachoma, has been treated successfully with ultra violet radiation by Saidmann, a success which is all the more valued in lieu of the fact that the condition quite generally defies and rebels all usual treatment. The radiation is delivered to the trachomatous tissue through a suitable quartz rod, a vigorous reaction being sought. The exposure is followed by an intense hyperemia, and, if the exposure has been even more severe, by the coagulation of the most superficial layers which then detach as a membrane and leave a perfectly smooth mucosa without even a scar. Occasionally the treatment brings on an edema of the lids, which lasts a few days or a week. It is best to apply each successive treatment after a lapse of time sufficient to insure complete disappearance of the edema. Naturally, the total number of treatments required will depend upon many factors and necessarily differs with each individual.

Conjunctival tuberculosis yields most splendidly to ultra violet radiation. This condition is relatively infrequent and, therefore, does not permit of any accurate expression as to the value of the method; but the literature everywhere reflects a high percentage of remedies in the number of cases where ultra violet has been used.

Eczematous keratoconjunctivitis responds favorably to water cooled ultra violet radiation. Hippel has treated some phlyctenular forms with fair results.

By reason of the strong bactericidal qualities of the radiation, ultra violet is useful

in dealing with gonorrheal ophthalmia. Here, the instillation into the eye of dilute solutions of photosensitive dye, for example a one to one-thousand solution of mercurochrome in water, adds materially to treatment. The dye permits the use of less energy and serves to accentuate the bactericidal effect of the radiation, while it minimizes at the same time the causticity of the ray on the epithelial cells.

I think it is pertinent to dwell for a moment upon the curious duality of the action of ultra violet radiation.

A cell, whether it represents a bacterial organism or a single unit in any of the body tissues, is chiefly a mass of protoplasm; by which is meant that its solid part is comprised largely of protein material. Proteins, according to the established concept of physiological chemistry, represent a complex structure built up of a number of individual units, each unit being called an amino acid. Abderhalden, the physiologic chemist, picturesquely called amino acids "Bausteine" (meaning building blocks).

Each protein presents individual characteristics which are dependent upon: (a) The variety of amino acids present in the protein molecule. (b) The percentage amount of each amino acid present in the molecule.

About 15 to 17 amino acids are basically predominant in all of the proteins that make up the pathogenic bacteria and the individual cells of the human tissues, in both of

which the dentist and the physician are interested.

Practically all of the amino acids were studied as to their behavior under the influence of ultra violet energy (Soret, Kober and Harris and Hoyt) and it is established that, in general, there is nothing strikingly peculiar about the action that amino acids display under the influence of ultra violet. This is expressed by Kober in the sentence that practically all of the amino acids show a very general ultra violet absorption.

But there are two striking exceptions. These include phenylalanin and tyrosine; and these two amino acids show a marked absorption for ultra violet such as is not shared by any of the companion "Bausteine."

Certain proteins, when ingested, produce an effect which is characterized by an undue sensitivity to light on the part of the individual. Zein (from maize) is especially active in this regard and is thought by many to be responsible for the sensitivity to light manifested by pellagrins. It is interesting to observe that the usual proteins from beef, chicken, fish and wheat contain only about two per cent of phenylalanin; but that zein, the protein of yellow cornmeal, contains over 61½ per cent of phenylalanin. And it is obviously this increased amount of phenylalanin that is conducive to the unusual light sensitivity which forms a part of the pathology of pellagra.

It happens that the phenylalanin and tyrosin content of the proteins comprising

tissue cells is not generally high; but that the proteins comprising bacteria such as staphylococci and streptococci show relatively high percentages of these two amino acids.

Here, then, is the explanation for the remarkable paradoxical duality of ultra violet energy. Human cells and organisms of disease exposed to ultra violet energy respond differently because the one is destitute of phenylalanin and tyrosin and the other holds quite a high proportion of these photosensitive amino acids. In other words, bacteria are selectively absorptive for ultra violet energy by reason of their protein composition which differs somewhat from the protein composition of only the generally absorptive tissue cell.

Now, remembering how ultra violet radiation deals differently with tissue cells and with bacteria, it is immediately interesting to study the problem of corneal affections and their treatment. A review of corneal physiology and pathology, which I must omit, convinces the ophthalmologist that in the treatment of corneal infection, there is required an agent capable of destroying the invading organisms, yet, since the cornea must remain transparent and free from blemish to be efficiently useful, there must be a minimum or no scarring of its layers; and both of these requirements are met by ultra violet radiation. Assuming that the use of atrophine, hot or cold compresses, irrigation and the remaining usual measures are effected, I shall discuss now the treatment of the ulcerative lesion itself.

This, simply, is the propection of ultra violet radiation into the ulcer. A tiny rod of quartz is directed toward the ulcer in such fashion as to be at right angles to the ulcer surface. The rod end is not made to touch the ulcer. It is kept a few millimeters away. The exposure lasts from forty-five seconds to a minute. The treatments are given every day if it is necessary to repeat; but a vast majority of the cases will respond in from two to three treatments. The results are decidedly good. I cannot leave the discussion of this subject without feeling inclined to emphasize its importance to the profession.

In otology, the radiant energies are no less useful. Novak was the first to employ water cooled ultra violet radiation in the treatment of otitis media, making use of the principle of photosensitization. Briefly, his steps in the treatment are these: (1) clean the ear thoroughly; (2) inflate it; (3) apply suction; (4) clean again; (5) lay head to one side, affected ear up. Fill canal with 1 per cent solution of mercurochrome (eosin containing mercury, prepared by Hynson, Westcott and Dunning). Let this slowly seep in through the drum perforation for from ten to fifteen minutes; (6) introduce straight quartz rod attached to water cooled lamp operating at between 50 to 65 volts, for from thirty to forty-five seconds; (7) repeat four or five times, about three or four days apart.

Considering next the ability possessed by the x ray to resolve lymphadenoid tissue, the otologist finds a splendid application for

this action in dealing with that type of impaired hearing that has its origin in obstructive pathology incident to hypertrophied lymphadenoid tissue involving especially the fossa of Rosenmueller. Without x rays, the otologist would be completely unable to effect any medication in this region capable of obliterating the lymphadenoid distension; but by projecting the x ray into this region on either side of the nasopharynx, a total resolution of lymphadenoid engorgement is obtained coincident with which the symptom of impaired hearing is dispelled in proportion as the obstruction is removed. It has been the common experience of every otologist to find associated with tonsillar infection a certain degree of contiguous infection of the membranes underlying the mucosa of the nasopharynx. Removal of infected tonsils by surgical methods has oftentimes been attended with a tremendously marked improvement in the hearing acumen of the individual. Infection of any portion of the lymphadenoid pavement of the nasal pharynx can take place when the tonsils have already been removed. This wide distribution of gentle infection cannot be done away with adequately excepting through the use of the x ray.

Similar in principle to the treatment of obstructive deafness with x ray is the equally efficient method for dealing with the condition often called chronic catarrh, which discloses itself on examination as a diffuse lymphadenoid involvement made manifest by the appearance in the nasopharynx of tiny elevations discreetly scattered. The

projection of mild doses of x ray on to these lymphadenoid swellings is followed by their rapid disappearance and by the cessation of all symptoms usually accredited to chronic catarrh.

The otologist is intensely interested in the tonsil and its pathology. The tonsil contains lymphadenoid structure; and, since lymphadenoid structure is affected by x ray, it would appear that this radiation might serve a purpose in the treatment of certain tonsillar conditions. The tonsil is likewise exposed to bacterial attack which probably is going on at all times as a normal event in the life cycle of that incompletely understood organ. The attacks may become so severe as to precipitate varying degrees of tonsillar infection; and, since the water cooled ultra violet radiation is so highly bactericidal, it would appear also that this energy could likewise find a place in dealing with infected tonsils.

It must not be overlooked that however slight may be the nature of a focal infection, that is of an infection which manifests in a focalized area, there always exists together with the purely focal reactions definitely recognizable systemic reactions. The systemic reactions may be so mild as to escape the notice either of the patient or of the physician; but this does not deny their actual existence. Blood chemistry is valuable in some measures to point out that changes are taking place. One change has to do with cholesterol metabolism and another with calcium metabolism; and both of these metabolisms are markedly

enhanced by the systemic application of air cooled ultra violet (Hess and Steinbock). In the case of the cholesterol metabolism, the lipoid passes from an inactive to an active state, probably through the rearrangement of the molecule; and in acquiring this active state it changes from a practically inert material to a material which is highly responsive to many chemical transformations and interactions. In the case of calcium metabolism there is a dissociation from the combined to the free state; but, more important than this, there occurs an actual increase in the amount of calcium present in the blood.

I do not wish to open again the question which has been so much disputed concerning the value of x ray in the treatment of tonsils. I think that any conscientious clinician, and especially one engaged in otorhinlaryngology, will admit as I do that there are many indications in dealing with diseased tonsils for which only surgery is adequately suited. Nevertheless, there are quite a number of instances where for one reason or another surgery is probably not the best expedient.

Undoubtedly the tonsillar capsule is an efficient barrier against the entrance of bacteria into the post-tonsillar vasculature, and the preservation of this membrane, whenever possible, would naturally make for considerable advantage in the final outcome of any given case. Surgery does not permit the retaining of this capsule; but the use of radiant energy does allow this desirable saving. I have elsewhere designated as a radiant "triad" the x ray, the

water cooled and the air cooled ultra violet. This "triad" is definitely valuable in dealing with those cases of tonsillar involvement where surgery has been eliminated for justifiable reasons from the contemplated treatment. Sometimes the justifiable reason includes the expressed wish of the patient to refuse surgical intervention; and at other times, the physician himself may feel adverse to the use of surgery because of an undisputed contra-indication that makes the risk of operation a serious one.

By projecting the x ray into the tonsils a definite shrinkage takes place in proportion to the amount of hypertrophied lymphadenoid tissue which is present. The x ray is not thought to have an immediate lethal effect upon the organisms; but it does definitely alter the enzyme activity of the cells irradiated. The enzyme activity is for the most part markedly increased. This holds true for salivary amylase and it is apparently valid also in the case of tonsils. I shall at some later time make this the subject of a separate communication pending the outcome of further researches which I am at present directing. The end effect of the increased enzyme activity is the destruction of organisms; so that indirectly the x ray does have the ability to lessen infection. Dunham's treatment of carbuncle with x ray is quite firmly established and finds every day application in general radiologic practice. The shrinkage of the tonsils aids in obliterating mechanically the crypts and spaces which harbor organisms.

Supplementing the x ray, the water cooled ultra violet radiation is then applied

to the tonsils where it exerts its superficial immediate bacteriological effect; and, through the hyperemia that it induces, it furnishes the additional materials necessary for the cells in their elaboration of increased enzymes and defensive products against infection.

Having thus directed two supplementing energies to the focus of the infection, the remaining energy of the "triad," air cooled ultra violet radiation, is displayed systematically over the body to correct the aberrancies in calcium and cholesterol metabolism which attend every infection.

It would hardly seem necessary to be compelled to repeat once again that the radiant "triad," so useful as the clinician unquestionably finds it to be, is helpful to a very large extent in certain cases and to a very small extent in other instances. It cannot entirely replace the surgical removal of tonsils; but those of us who see in the tonsil an organ endowed with functions necessary to the economy as an agent active in establishing immunity, following the teachings of the Europeans, are convinced that when surgery is justifiably excluded as the treatment necessary in a given case, that the "triad" of radiant energies becomes a valuable and highly efficient alternative.

It is frequently observed that in the case of toxic goiter, the lymphatics in the region of the thyroid and the upper respiratory tract show evidence of deviation from the normal. Because of the properties al-

ready attributed to the "triad" of energies, it is obvious that as an accessory to the usual treatment of toxic goiter ultra violet radiation to the upper respiratory tract and x ray to the chain of lymphatics extending down to the thyroid become most helpful adjuncts as complements to the usual x ray treatment whose efficacy is already widely recognized.

There is an increasingly growing conviction among those who investigate the thyroid syndrome from the viewpoint of endocrinopathy that most thyroid dystrophies, exclusive of cystic degeneration, present endocrine instability which can in most instances be considerably alleviated, and in not a few instances entirely dispelled, mainly through endocrine correction without necessarily recouring to surgery. Probably one of the leading exponents of this fascinating and extremely important subject is Dr. Maximilian Kern, whose researches in endocrinology are well recognized.

I would say parenthetically that I wouldn't have the impression go out that radiation alone will correct thyroid dysfunction. It merely reduces the hypertrophies, and then by the contemporary use of the thyroid extcasts and suitable medication the patient is restored to health, if it is a case that can be cured without surgery.

For the entities that I have named in this discussion the various energies are capable of accomplishing great good. There are, of course, many minor uses for these dif-

ferent radiations that afford clinical relief; but these can hardly be classed as being of the same magnitude of efficiency as are the specific instances that I have mentioned. To speak of the status of radiotherapy in ophthalmology and otolaryngology without referring to the specificity of the treatment of hyperesthetic rhinitis with air cooled ultra violet radiation would be to neglect one of the most exact practices in all therapeutic accomplishment. Mainly through the work of Novak Hollender and Disraeli Kobak, it is quite definitely established that hyperesthetic rhinitis is attended nearly always with a certain amount of lowering in the total calcium content of the blood. The exact significance of this lowering is not entirely clear. When the individual who shows hyperesthetic rhinitis is exposed to the biologic action of air cooled ultra violet radiation, the calcium of the blood rises to its normal level, and coincident with this rise the symptoms of hyperesthetic rhinitis disappear, to leave the patient free from any obvious trace of the disorder. Many otologists and otolaryngologists have had abundant opportunity to put this therapeutic phenomenon to critical test; and it is generally agreed among all that thus far ultra violet radiation has not yet failed in effecting what amounts to a clinical cure. This is entirely on a par with the specificity of action that ultra violet shows for rickets, as Hess and his followers have so often and so aptly demonstrated; but whereas rickets will yield similarly to cod liver oil, hyperesthetic rhinitis cannot be influenced so surely by any other therapeutic measure as it can by biologic ultra violet radiation.

All of us should forever bear in mind an apparent truth; that we can know little about the action of the various forms of radiation until we first know more about the physiologic activity of the cell. We are compelled to follow the progress of the physiologist. But there is hardly a thinking being who has made any sort of survey of the status of contemporary knowledge relative to radiation and of contemporary knowledge relative to biology who has not sensed the obvious;—that matter and energy are infinitely more similar in the ultimate than they are superficially unlike. By the regulation of the forces of matter through the forces of energy, we have already realized and will certainly realize more in the future a therapeutic progress that shall be enjoyed not only in ophthalmology and otolaryngology, but in every branch of medical and surgical study. We have reached that stage of progress in therapeutics which needs more than ever the admonition so tersely expressed by Robinson, that, "of all human ambitions an open mind eagerly expectant of new discoveries and ready to remold convictions in the light of added knowledge and dispelled ignorances and misapprehensions, is the noblest and the most difficult to achieve."

DISCUSSION

Dr. William A. Lurie (New Orleans): I enjoyed Dr. Denman's paper particularly because of my own findings in treating conditions as they have always existed about the mouth. I have noted that through treatment by ultra violet or physiotherapeutic treatment these associated conditions in neighboring organs, eye, ear, nose, throat,

have been particularly benefited. I say this as supplement and comment to Dr. Denman's paper. I believe that it is not always necessary to make a direct application of your ultra violet modality to the part either affected or infected.

I recall a very interesting case of traumatic corneal ulcer that healed through ultra violet radiation used exclusively within the mouth and externally to the eye laterally, not directly to the ulceration, as Dr. Denman described.

In cases of trifacial neuralgia it has been my experience that through treatment directed through the mouth there has been a happy effect and great relief of pain. The series of cases that I have treated in that manner is too small to make any definite statistical report upon, but I have yet to find a case that has not been benefited to a degree sufficient to be called a better treatment than that which had been instituted previously.

Dr. Maxmilian Kern (Chicago): I want to give the usual felicitations to Dr. Denman for his very careful paper, particularly in view of the fact that I know he has been a hard convert to the laws of physiotherapy and endocrinology. He is ultraconservative and must be shown, but I have had the great pleasure of seeing about 50 cases of various thyroid intoxications treated by Dr. Denman, both in Toledo and in Chicago, and I must say that he should be put down in the history of medicine as a pioneer in two ways, one in accepting the conservative method of treating thyroid diseases and

thereby denying the possibility of making radiotherapy a panacea or cureall for endocrine disturbances.

Dr. Denman has very aptly mentioned, although parenthetically, that you cannot cure thyroid diseases with radiotherapy alone. I believe that should be very obvious, but while it is obvious, it should be very much emphasized in view of the fact that we have had people in the United States advocating the use of x ray for the treatment of thyroid toxicosis.

Bram, of Philadelphia, who is opposed to surgery and very heroically presents his reasons for being opposed to it, has found that radiotherapy is contra-indicated in all thyroid diseases. The reason for his statement is that there is a possibility of turning a hyperthyroidism into a hypothyroidism in view of the atrophy of the tissues. That also is obvious since we realize that an adenoma is filled with a colloid mass, and if that colloid mass is dried up through the x ray the function of the thyroid is altered completely and the metabolism is disturbed, thereby causing at least temporarily a hypothyroidism. This danger does not in any way compare with the dangers of using Lugol's solution, or iodine, or thyroid extract, which all the internists and endocrinologists have been using of late, and changing a hypothyroidism into a hyperthyroidism, or a mild, innocent, so-called physiological adenomatous condition into a toxic goiter. I have seen hundreds of those cases.

If we can establish ourselves on a middle course and know that we deal with a toxic goiter, and if we try to establish a proper

function of that toxic goiter, namely turning down from a 50 or 60 plus basal metabolism to a minus 10 or a normal, and at the same time treating the lump in the neck, as Bram calls it, or the enlargement with the triad Dr. Denman has described, we have a very happy medium. If we don't use the triad we usually meet with a great deal of disappointment, for very plain reasons.

A patient who comes to the doctor has only one way to recognize that he is suffering from thyroid trouble. The neck is enlarged, he feels badly. The doctor gives medicine and the patient starts to feel better, but the neighbors and friends still notice that the goiter is as big as ever. Consequently he quits the doctor and goes to another until finally he lands in the operating room and has one or two lobes of the thyroid removed; then the patient is ever after, to my way of thinking, an invalid. That is even more true in the plain adenomas.

You get a patient with enlargement of the neck but no symptoms of hyperthyroidism. He has a basal metabolism of probably plus 15 or 20, which you can discount 20 because the patient has gone to the laboratory in an excited condition, with a mild tachycardia, worried about his appearance. Somebody sends him to a surgeon who cuts the lump out, and that patient never has a normal basal metabolism from that day on.

I have a great deal more to say about that, but I am scheduled to give a talk myself on Thursday.

The studies that we have made in calcium metabolism have ripped this medical world into pieces. The A. M. A. had an article for it, then Dr. Sonnenschein and Dr. Perlman wrote an article against it, and now we don't know whether we should or should not believe in the calcium theory. As Dr. Hollender explained it, the fact that we deal with the combined calcium metabolism makes it a pretty difficult proposition to test and therefore not very practical in the average case of hypersensitive rhinitis. Dr. Novak particularly has observed that in a hyperesthetic rhinitis the tissue or membrane within the nose looks pale and very much similar to the tissues in a myxedematous case. He has made a number of basal metabolisms, (so have I) and in 100 per cent of the cases handled he found a low basal metabolism in a hyperesthetic rhinitis, considering that a hyperesthetic rhinitis is a cold with an infection, and it is very interesting or significant that there is such a great similarity between a hypothyroidism and a hyperesthetic rhinitis. That probably explains why thyroid extract rather than parathyroid is so useful in the treatment of hyperesthetic rhinitis.

Dr. E. C. Ingham (Portland, Ore.): I want to ask the Doctor one question. He spoke about gonorrheal ophthalmia. Will the Doctor tell us how he treated it? We treat obstinate inflammations and trachoma with these rays very, very successfully. I would like to get your technique.

Dr. Ira O. Denman: I use a flat shaped quartz electrode in the treatment of gonorrheal ophthalmia. It is devised primarily

for the treatment of pyorrhea in dentistry. It presents a wider contact surface to the lid. I direct it into the conjunctival notch, away from the cornea, because the exposure is necessarily longer than the lens would be supposed to be subjected to. By making the application in this manner the ray is directed, of course, at the axial extremity and does not meet the visual structures of the eye.

The treatment is carried on sufficiently long to create a reaction, because in the reaction we get an additional bactericidal effect from the elements within the blood itself.

I wish to express my appreciation for the manner in which the paper was received. I hope I left the impression with you that we are merely pioneering and in a conservatively

manner we are feeling our way, are to be found in the new things and not allowing our prejudices in favor of the old things to mar the future of what may be an epochal achievement in medical practice.

Certain things we know; we have demonstrated them over and over again. We know there is virtue in physiotherapy, especially in radiotherapy. Its limitations are yet to be determined. Its *modus operandi* we cannot fully explain. As I said in the paper, we must follow the physiologist in that. Physiologists are not yet ready to declare themselves in certain terms, but progress is surely being made. I would welcome any reports that any of you can make upon lines along my special interest so that when we meet again, if I should be privileged to be a guest a year hence, we can check up on these things and by collaborating and combining our experiences, further enhance the progress of the new therapy.

TREATMENT OF VARIOUS FORMS OF ULCERATIONS BY THE USE OF ULTRA VIOLET RAY*

ALBERT KROHN, M. D.,
Detroit, Michigan.

MY paper this evening on the treatment of surface or skin ulceration by ultra violet is presented not for the fact that I wish to go into the etiology and pathology and even treatment of these conditions, but rather to present to you my own practical experience and results obtained by various methods of technique used. To be sure, a great deal could be said about these conditions, but I know that you must feel just as I do—that we are here as physiotherapists to assist one another in getting the greatest efficiency possible through these newer agents.

There are not a great many standard rules set for physiotherapy treatment because of the fact that it is such a new field. Surely, we have only touched upon its surface and as time goes on, we will find more and more that its application will be in much greater demand because of one thing, and that is that we can produce quicker results and less harmful results than the older means used by the physician.

Tonight, therefore, I am presenting a series of cases giving you the different forms of treatment which I have employed; the reason why I have employed them and the forms of treatment which I have found most favorable.

*Read before the Fourth Annual Meeting of the American College of Physical Therapy, Oct. 19, 1925.

CHANCROIDAL ULCER

The condition which first comes to my mind is the chancroidal ulcer. I think that I have had more of these ulcers referred to me than any other type because it seems that the practitioner is unable in the more severe cases to get satisfactory results.

These ulcers, as you know, may begin as pinhead spots and may develop to a size where they include almost the entire genitalia and are caused by the chancroidal bacillus.

I will divide these into two classes for the purpose of showing my point. The first class will be those which came to me directly and the second will be those which were treated by caustic agents such as silver nitrate, nitric acid, carbolic acid, and so forth.

The first group seemed to have cleared up more readily than the second because of the fact that in the latter the use of these caustic agents coagulated the tissue, forming a hard crust which enabled the organisms to work unmolested and to throw off its poisonous toxins which destroyed more tissue and burrowed more deeply into the tissue.

It is a well known fact that the short ray ultra violet also destroys tissue, but its de-

struction is not produced so quickly and so deeply as the caustic agents and, as you have all observed, you do not get the hard, crust-like formation after its use.

Before beginning, I made certain, of course, that I had a pure chancroidal ulcer. This was accomplished through the use of the dark field. I then treated these ulcers, varying in size and shape, with the short ray ultra violet until I had gotten to that point where I had nothing but a serum crust—all of the pustular exudate having subsided. I then changed this form of treatment and began the use of the long rays. My results were not satisfactory. It seemed at first that the ulcers were filling in and that their edges were granulating, but after a week of this I realized I was accomplishing nothing. All treatment was given in increased dosages, beginning with two minutes, increasing to four, six, eight minutes, and so on.

It occurred to me at this time that an ulcer of this type is always infected. By that I do not necessarily mean that you always have a pustular condition, but I do mean that the organisms and their toxins are always present in the tissues until you have a completely granulated surface. I, therefore, decided to treat these conditions with nothing but the short ray ultra violet, because of its destructive power.

I began the progressive treatment and increased the dosage daily; later I painted all surfaces with a dye such as mercurochrome to increase the efficiency of the ray. My results were much better. I really was

pleased with this method, however I felt that I ought to shorten the time that it took me to obtain these results. I, therefore, decided to overexpose the ulcers with the short ray, after painting with mercurochrome, and began by giving a ten minute treatment the first day, fifteen minutes the second day, fifteen minutes the third day and twenty minutes the fourth day. After this I gave twenty minute exposure until the tissue had filled in and granulation had begun on the edges, and the ulcer was of only small size, then I cut down on the length of time until I had a completely granulated surface. This method I have since followed and am indeed very well satisfied.

At this point I want to cite one case that came to me during the month of April. This patient had a true chancroidal ulcer about four inches in diameter on the posterior surface of the penis forming almost a complete circle. It had burrowed so deeply that the urethral wall was already exposed. The condition at that time was of seven months' duration. He was under treatment all during this period, frequent dark fields were made to make sure of diagnosis, caustics were frequently applied, salvarsan and mercury were given, and almost every other form of treatment known to man was used. The condition became progressively worse. He was referred to me after two doctors had given up in despair. I began drastic treatment. My first exposure, after painting the ulcer with mercurochrome, was ten minutes, second fifteen minutes, and my third was twenty minutes, and here I re-

maintained. His pain was so excruciating that morphine and codein were given for relief.

I treated the patient for six weeks with absolutely no results; however, at the beginning of the seventh week, granulation became evident. The ulcer showed signs of filling in and a healing process could be seen around its entire edge. Once started, it seemed that I could almost see the tissue growth, and at the end of twelve weeks I discharged the patient as cured.

I, therefore, want to emphasize to you the benefit of overexposure in this type of case.

VARICOSE ULCERS

Here we have an entirely different condition. The cause, of course, is due to circulatory disturbances which are assisted by the patient's mechanical efforts to stop the itching present. In those cases which are secondarily infected, it is wise to begin the short ray treatment to kill the organisms present, but the treatment proper consists of the use of the long ray. I found after some experience that overexposure was very destructive to the tissue and retarded healing process. I have, therefore, proceeded under a very definite plan for treatment in these conditions.

I begin by giving a one minute exposure at an 18 inch distance and increase one minute daily until I have reached fifteen minutes. At this point I use 30 inch distance. I also attempt to assist the circulation by the use of slow sinusoidal current.

My results have been quite satisfactory. With these ulcers, as with those mentioned before, I have had a number with which the physician has been unable to get any results within a short period.

I wish to emphasize the fact that overexposure rather retards the treatment of varicose ulcers and that underexposure is really the best method of attack.

PSORIASIS

I am leaving the field of ulcers to consider a skin condition, but I have seen so many cases of psoriasis that have been labeled as incurable and yet have shown such good results that I believe it deserves a word of mention at this time.

When I say results, I mean that when the patient was discharged all inflammatory patches were gone and the skin was perfectly clear. I feel quite sure that I have not produced a permanent cure because most of these cases clear up either partially or completely during the summer after basking in the rays of the sun; however, I feel that with this form of treatment, we have a shorter and easier method of ridding the patients of this condition. Considering the fact that one exposure given every two weeks will keep the patients' skin clear, it certainly seems like an easier and better method than any presented before.

I took a series of 22 cases and treated them with the short ray ultra violet; the conditions ranged from small silvery patches on the elbow to large patches on the

extensor surfaces of the arms, forearms, thighs, legs, face, chests, scalps and backs. As might be expected, they were all old, chronic conditions running for a period of years. My results were not satisfactory. I noticed a little progress, but nothing to consider the treatment as a good remedy, and in all cases the patients were very much dissatisfied. I then resorted to the long ray ultra violet. I began by giving a two minute exposure and increased two minutes each day until I had reached sixteen minutes, where I remained. Results were better, but much too slow. I also injected salvarsan, mecury, arsenic, sodium salicylate and painted the areas with chrysarobin.

The crusty surface was beginning to loosen up, scales were disappearing, chronic spots were bleaching to a light pink, but all too slow.

I then chose my most severe case—a young lady twenty-two years of age, apparently healthy, giving no history of psoriasis in the family, but having had this condition as long as she could remember. She had had no previous treatment from me. I told her that I would overexpose her and that she would feel the ill effects of it twelve hours later, which amounted to severe burns, but she was willing to stand it, having suffered so long that nothing seemed worse than her disease.

I began by treating her with a fifteen minute local exposure to the areas at a distance of 18 inches. The next day she came back to me and told me that her bed was completely covered with scales and

crusts. A decided improvement in the condition was evident after one treatment. I carried this on for two weeks. By that time there were only a few small crust spots left; the scales had completely vanished and the patches of inflammatory processes were a very light pink. I then began giving her general exposure for ten minutes at a time, increasing one minute daily until I had reached fifteen minutes. This I continued for fourteen days, when her condition was practically gone.

This young lady comes to me every two weeks for general exposure and has been free from psoriasis ever since.

The other cases I decided not to attack so strenuously, so I started with a ten minute exposure and increased one minute daily until fifteen minutes was reached, then began general exposure. My results were very satisfactory, with less suffering to the patient, so I use this as general routine in my practice.

Here I wish to stress one point: to get results in the treatment of psoriasis, it is more satisfactory to overexpose with the long ray ultra violet.

OLD, CHRONIC FUNGOID ULCERS

I have seen a few cases of chronic fungoid ulcers and, as it happened, all appeared upon the leg. They were of quite long duration; one patient complained of having his malady for twelve years. On further questioning, I found that they had been subjected to various forms of treat-

ment, but a permanent cure was never effected. In no case was ultra violet used.

I began my treatment by using long exposures of short ray ultra violet, after having painted the affected area with mercurochrome. The lamp was in close apposition with the skin. I continued treatment until all ulcerations had disappeared. I then had an open lesion devoid of any pathologic ulceration. I proceeded next to treat this new condition with the long ray ultra violet and a healing process began. As the condition cleared up, I noticed that new pin point ulcerations began. This, of course, was due to the fact that I did not completely eliminate all of the spores. I felt that at this period it would be more beneficial to use something more drastic than ultra violet, so I touched up all new lesions with pure carbolic acid, followed by pure nitric acid. This did very well and the patients went on to recovery.

LUPUS VULGARIS

Lupus vulgaris, as you all know, is a form of tuberculosis of the skin characterized by small, soft tuberculous patches, which may undergo absorption, but which usually ulcerate and generally heal with scarring.

It has long been known that short ray ultra violet is specific in the cure of this disease. I think that it was Finsen of Copenhagen who employed it first in the treatment.

The only thing that I wish to say in regard to this condition is that to obtain quick

results and as little scarring as possible, overexpose your patients as in chancroidal ulcer. Results will be most gratifying. I have found this to be the best method.

In concluding my paper this evening, I want to lay stress upon the fact that ultra violet energy is a definite chemical commodity which should be measured by time and distance, which has an ordinary definite dosage just the same as any other drug or chemical we use. Certain conditions, however, warrant that we either increase this dosage or decrease it.

GENERAL CONSIDERATIONS

When we consider drugs, certain definite amounts by weight are laid down as a regular dose, such as sodium salicylate grs. 5, phenacetin grs. 5, morphine grs. $\frac{1}{4}$, and so forth, but when conditions arise we are forced to give markedly varied amounts such as an intravenous of 15 grs. of sodium salicylate or urotropin or any other drug which is indicated in the condition before us. So it is true with ultra violet.

We must set a definite standard of normal dosage, but surely the amount given must be governed by the character of the condition which we have to deal with. As with the use of medication, when large amounts are given, one must be careful that the destruction to the kidney and the other parts of the body is not so great as to be worse than the good done; so we must be exceedingly cautious with the use of ultra violet, because it is such a strong chemical agent. I do not think that the short ray ultra violet has to be watched as closely as

the long ray, because it seems that pathologic tissue will take a great deal longer exposure than normal tissue without actually presenting symptoms of burning; however, when you are treating a general skin condition with the long ray one must be particularly careful because of the damage which may follow.

When I say that short ray ultra violet is not so prone to affect the other parts of the body so readily, I wish to immediately qualify the statement. It seems that in all surface ulcers where short rays are used the lamp is in direct apposition to the skin and only the pathologic tissue is affected. In this way it seems to be of less danger.

In tuberculous cases, as you know, long exposures may bring on a hemorrhage; fair haired persons with thin skins burn very readily; burns bring on itching; itching brings on scratching and our malady becomes worse. It is, therefore, very essential that we take all of these points into consideration and give our treatment on a true definite, scientific basis, just the same as we do with any other of the medications that we use.

I want to add just one more point before closing. It is wise and quite essential that we keep our quartz burners and quartz shields clean at all times. It is known that the ultra violet ray is very delicate and that it does not pass through dirt or grease. It is quite obvious that we will be unable to get results when we get no ultra violet.

After due consideration, I find that it is no more expensive to change our burners

yearly than it is to carry them over a period of two or three years. The company selling this equipment have a definite commercial scale on the decreased value of the burner. It costs no more to trade in your burner each year than it does to wait until it burns out, and I feel that after one year's use the quartz becomes very much slower and results are not so readily obtained.

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DISCUSSION

Dr. A. R. Hollender: Several points mentioned by Dr. Krohn are indeed worthy of repetition and emphasis. There were several points mentioned that are very practicable in his paper, and too often negligence of these factors is the cause of poor results.

In regard to the question of ulcers, I would have much preferred if Dr. Krohn had classified his ulcers into two groups, the so-called skin ulcers and the so-called mucous membrane ulcers. It is quite obvious that treatment from the standpoint of ultra violet light must be different for each type.

Our experience in the treatment of ulcers of the mucous membrane, such as you commonly find in the nose and the pharynx, is very successful with ultra violet ray, and such ulcers are cured in a comparatively short period of time.

I have not had very much experience in the treatment of skin ulcers, but I do know in the treatment of ulcers of the mucous membranes the analin dyes come in very

handy, and certainly they enhance the results.

There is one thing that ought to be mentioned in connection with ulcers in general, and that is the work of Grove and Vines of Cambridge, who suggested a few years ago the use of calcium in parathyroid therapy in these conditions. Their investigations showed beyond any question of a doubt that ulceration and a deficit of calcium in the blood had a very direct connection, so that in conducting their experiments they had administered calcium in various forms, orally, intramuscularly, intravenously, and they found that their best results were had either intravenously or intramuscularly. However, after a period of time they found that their ulcers returned, and they noted that it was necessary to use some sort of a fixing agent, such as parathyroid extract, to make the results permanent.

Our experience in treating ulcerations of the mucous membrane has convinced us that we can replace the use of the endocrines, such as parathyroid, in these cases, by ultra violet.

However, I do not agree with the essayist in the matter of wave length. There is some question, to my mind, whether the essayist is correct in suggesting that the difference of distance has very much to do with the subject of wave length. At least this is a subject very much open to discussion, and I personally have some views along that line that do not quite coincide with his.

Dr. G. A. Larsen (Hayward, Wis.): I want to corroborate some of the things that Dr. Krohn said about treating varicose ulcers. I had one case that I treated starting in at about a 30 inch distance. When I got down below 24 inches I noticed that I did not improve the effect, so I used a greater distance, but kept increasing the time. The case immediately progressed and healed entirely.

I have a case at the present time, however, that has refused to submit to therapy. It is the first one of its kind that I have had. Perhaps the Doctor could help me out. After the first treatment the pain was very much lessened and has almost entirely disappeared. There was an extremely bad odor, which has practically disappeared. The ulcer at present looks clean, but it will not heal, and I have been treating it for nearly three months. I have tried both long target distance and short exposures, but I can't get any results.

I was advised the other day to use diathermy. I gave one treatment before I left home, but I have not tried it long enough to get results.

I find in many case reports on ultra violet they state either the time or the target distance, but not both, which I think is very essential.

Dr. O. W. Wyatt (Manning, Iowa): I think there are quite a few things that should be said on varicose ulcers. In the first place, most of your ulcers have not lost all the skin. In the center of those ulcers

are little hair follicles that still have epithelium. I think if you dress these ulcers effectively, putting on a dressing that does not pull off the epithelium, you will find in three or four days you will have little islands all over the ulcer.

Besides that you must not forget that you must increase the blood supply, and you must put on a mechanical support. Don't forget the things that we have already had. Use them all. Along with these other things use your physiological ultra violet. Whether it activates the blood, or whatever it does, I cannot say. I only know that we have better results.

I believe if you take those fungoid ulcers and burn them out with diathermy, you will find you will save a good many days and obtain quicker healing.

From the experience I have had in treating ulcers I think I can heal any ulcer that is not due to lues with ultra violet, medication and mechanical treatment.

Dr. Disraeli Kobak: The essayist's point with reference to chancroids is well taken, but I regret he has not explained why he used the water cooled lamp. I would suggest that whenever he uses the ultra violet light he should be sure about the purposes of the light, whether he wants to use it for destructive effects or whether he wants to use it for biologic effects. The water cooled lamp is used *per se* for destructive effects.

In chancroids and ulcers of that type, the use of the water cooled lamp is the method of choice. In combination with that, if he

would use the gentian violet instead of mercurochrome, he would find that his ulcers would heal readily under the combined effect.

I am sorry he did not mention cases like the one Duval mentioned, like the osteomyelitis conditions. Duval made a very shrewd point there, and I wish to emphasize it. He used long rays of the ultra violet. There is a reason for that. I very well remember several cases in which I have used both the short and the long, that is the air cooled and the water cooled types of lamp, and I found whenever I wanted to irritate and produce quick granulation, I got the maximum effect with the water cooled or long wave lamp. In cases of chancroids you want to get a rapid and maximum granulation. In cases of osteomyelitic conditions you want to get a slow, physiologic reaction. We know that all cases of ulcerations suffer from a low calcium content, and if you want to fix your calcium content most effectively, use your ultra violet air cooled light. It is not a question of inches, it is a question of reaction. What you want to do is get your first degree or second degree of reaction, or, if necessary, third degree, but it is a question of reaction, not of distance. Some lamps will produce a quicker reaction than others; some individuals will give a quicker reaction than others, so it is a question of reaction produced, not the distance of the lamp.

There again I want to go back to the osteomyelitic condition. You have drainage there. You have removed your sequestrum. Drainage is essential. If you use

your short rays you are going to close up the one form of exit you have for drainage, and you will impose injury upon the structure. On the other hand, if you will paint over the ulcerated condition with a little bit of vaseline, you will protect that part and the rest of the body will be benefited by the ultra violet irradiation.

In psoriasis I regret to take exception with the essayist. Short distances are not effective. They do not penetrate. Long ones also are ineffective if you do not use in combination with that the x ray. In my experience the combination of the x ray with the ultra violet has been effective. The air cooled lamp alone has not been effective. You may reduce the condition temporarily, but it reassumes itself again as virulently or as effectively as before.

In my experience with leg ulcers, the combination of the ultra violet plus the diathermy gives the best results, and that is the combination I am using today.

In lupus, the pressure type of application is the thing to use; that is, the water cooled type, but to do that you must first scale off the nodule and produce pressure. But to do that alone is not effective entirely. If you have a lupus condition of the nose, very frequently the hole will start from within instead of from without, and you will wonder, since you have irradiated the outer portion, why destruction has taken place, and that is the reason for it. I have also noted beneficial results from lupus when general irradiation was given.

Dr. Albert Krohn: I want to thank the doctors very much for discussing my paper. I know from the discussion that the doctors have had a great deal of experience along this line, and I feel that their treatment has been given along the same lines that I have just suggested.

Only one word of criticism can I say, and that is that one of the doctors suggested the use of diathermy in chancroidal ulcer. Diathermy does very well in the treatment of chancroidal ulcers, but you must consider the position and the condition. If you have an ulcer that is over the urethra and you are going to use diathermy and you produce a necrosis and go into the urethra and form a fistula, you can readily see that diathermy would not work efficiently. We must consider all of our cases. We cannot necessarily criticize one particular type of treatment, because there are several conditions which will govern.

A great many of the cases that come to me have had carbolic acid and nitric acid combined. Of course the carbolic acid was used as a local anesthesia, and surely there was as much quick destruction by the use of these agents as you would get with diathermy. Certainly diathermy is not a cure-all in that one condition. With the results I have obtained, I am quite satisfied that the water cooled ultra violet is quite satisfactory.

In the one case mentioned, the ulcer of four inches in diameter went seven months with the use of the acids, carbolic acid and nitric acid, with no results. The ulcer be-

came worse. I treated that case, and in six weeks I received absolutely no result, but in the beginning of the seventh week healing process began, and at the end of twelve weeks the ulcer was healed.

Considering the treatment of the chancroidal ulcers with regard to calcium metabolism, it seems the physiotherapy field has gone wild on the general healing power obtained through the use of the long ray ultra violet through its stimulation of the sympathetic system, increasing calcium metabolism. Of course, that is quite true; there is no question of that, in my mind, and that has definitely been proven. It has been proven in the treatment of rickets. Nevertheless, we don't want to think that we can take every case and give them a general exposure of ultra violet and call them cured. It can't be done. It no doubt will help, but you must treat the condition that you are taking care of at that time.

As you know, the normal tendency of lacerated tissue is to heal, and when you have a lacerated tissue that will not heal you have either one or the other of two conditions: you have either a generalized condition of debility and anemia or syphilis, or a local bacterial condition such as you have in chancroidal ulcer. If you will remove that bacterial invasion, with its toxins, you will get healing power, and if you don't remove that you must wait a long

time until your general condition is built up, and possibly at the end of that time you may get healing, but I can't see why we should wait for the body resistance to take care of ulcerations when we can so nicely exterminate them with our water cooled machine.

In regard to distance, I assumed the closer the lamp is to the area, that is, within a distance of approximately 10 or 12 inches, the more rays we have going to the point because of centralization of rays.

In the treatment of varicose ulcers, the Doctor mentioned that he had a case that did not heal. Here I must modify my statement because I have not seen the case, and that is important, but I think if calcium had been given and general radiation, that is, of the air cooled lamp or long ray, a healing process would have set in. I would also suggest that the slow sine wave be used there to stimulate circulation and general metabolism.

With regard to psoriasis, I am sure that I did not cure it permanently; I am positive of that. I know that if there are any dermatologists here they will criticize me for saying I cured it. But, as I said in the paper, I feel that this is an easier and a shorter way to get rid of it and to keep the patient rid of the condition.

FISTULAE AND SINUSES*

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THE ultimate public estimate of a thing, even of a procedure in medicine, is a fairly sound criterion of its value. It is true that public opinion makes mistakes; it goes enthusiastic over worthless frauds, and it lacks faith in unadvertised treasures. But taking averages over sufficiently long periods of time, it is quite certain that the thing that becomes popular has some real value; and the thing without value remains only briefly in public favor despite all efforts at advertising. That is only stating in different words what Abraham Lincoln said about fooling the people.

This is apropos of the present day popular prejudice against surgery. It is as much as to say that in some of its claims surgery has been weighed and found wanting. If surgery were actually the quick and infallible *cure* for as many conditions as we fondly believed it to be during this past generation, public experience would have found it out by this time, and hailed it as the universal benefactor. There is no hesitation in the public mind, for example, about the efficacy of castor oil as a purgative. Possibly it is the overenthusiasm of individual surgeons, and the injudicious application of surgery in the past, that is making it difficult today to persuade a patient to have an operation performed when

surgery is actually indicated; for the public is unable to discriminate in the individual case.

In the case of fistulae and sinuses, statistics come to the support of public opinion, which after all is nothing else than a form of statistics—accumulated facts subconsciously interpreted by the masses. In many cases surgery as such fails to handle these cases; in many others it is not the most effective nor the most desirable form of treatment.

ETIOLOGY

In order to understand how to treat a fistula or a sinus, it is first necessary to have a clear understanding of what it is and how and why it came to be there. A fistula is an open channel between two body cavities or between a cavity and the surface, lined with granulation tissue or epithelium, and limited by an inflammatory membrane. A sinus is practically the same thing, except that it ends blindly in the issues, in a gland, or in a bone. The chief characteristics of both are their chronicity and failure to heal. The reasons for non-healing are as follows:

1. *Congenital fistulae or sinuses.* These do not heal because of the intrinsic character of the tissue through which they run. They occur most frequently about the neck

*Read before the Fourth Annual Meeting of the American College of Physical Therapy, Chicago, Oct. 19, 1925.

and in the sacrococcygeal region. In these places there are natural orifices or channels during embryonic life, and the tissue about them has a tendency not to close together, any more than the mouth, ear, urethra or anus will close. Normally, in these locations where temporary openings exist in the embryo, the orificial character of the tissue is lost, and closure takes place before birth; but if an error in development occurs and the tissue retains its orificial properties, an open tract remains; the resulting fistula or sinus will not heal naturally.

2. *The presence of a chronic irritant within the tract.* The best known example is a sequestrum of bone, which keeps up a sinus or fistula as long as it is present. Foreign bodies of a rough or of a partly soluble nature, such as splinters, threads, etc., will keep sinuses open; on the other hand, sterile, smooth, metallic bodies become encapsulated and closed over. A focus or infection or a pus cavity connected with a fistula is also a cause of nonhealing.

3. *An irritating discharge.* A stream of waste and toxic material that has been eliminated by the wound, decaying and infected, constantly flowing over the walls of the tract, prevents the growth of healthy granulation tissue, both because of its toxicity and because of its mere mechanical presence.

4. *The inability of a cavity to close itself.* As a rule, a cavity cannot heal up or fill with granulation if its walls are not in apposition. There is no stimulus for nature to fill up such a space; and it remains

as a discharging cavity. For healing, mechanical coaptation of the walls is necessary.

5. *Insufficient drainage.* If healing of a sinus or fistula takes place, it must do so from the bottom outwards. But, if an acrid, decomposing, usually infected discharge collects constantly in its depths, healing can never take place.

6. *Lack of rest of the part.* If most of the available energy of the part is used up in physical work, little or none will remain for the complex and expensive constructive processes necessary to healing. Immobilization is a lesson that the orthopedist has taken to heart; we realize its importance in acute local infection and in systemic conditions. Its importance is not always sufficiently appreciated in chronic, low grade processes.

7. *Specific infection of the wall of the tract.* This is usually tuberculous, in which case tubercles can be found among the granulation tissue of the walls. Syphilis and actinomycosis are other causes that I have found in my experience.

8. *Epithelium lining the wall of the tract.* Squamous epithelium may grow down into the fistula from mucous or skin surfaces at its extremities, in which case healing is impossible because mucous surfaces will not grow together.

9. *Constitutional debility.* Systemic causes of nonhealing play a very important part; many failures are traceable to neglect of this factor. Specific infections, such

as syphilis and tuberculosis, are very common and must be considered in every case. Merely a condition of undernutrition from poor or insufficient food, overwork or following exhausting acute infections such as typhoid fever or influenza, may suffice to explain nonhealing. The debility incident upon chronic nephritis, cardiovascular disease and similar conditions is sufficient to be responsible for nonhealing.

In no case are all of the above causes present at one time; but there are always several causes operating together. In one case, it is a certain chief factor or group of factors that prevents healing; in another, an influence of totally different character stands in the way of recovery, requiring a totally different treatment.

It follows obviously that there can be no routine treatment for fistulae and sinuses—physiotherapeutic, surgical or otherwise. When a patient comes in suffering with one of these things, do not immediately reach for the electrode and the switch handle. Begin with a careful history, not only of the condition of which he complains, but of his life and previous illnesses and associated conditions, in the hope of casting some light on the cause of the origin and persistence of his fistula. Examine his fistula; but also examine all the rest of him, and hunt around pretty carefully for the little hidden things that may betray to you the secret of efficient and successful treatment. It is possible that you do not give the patient a treatment on his first visit, nor indeed not until several days of examination have

elapsed. Two cases may come in looking very much alike; and yet their treatments may be astonishingly different from each other, depending on what the examination discloses. A long, painstaking examination may at first seem a waste of time; but in the end it saves a good deal of unsatisfactory floundering, both mental and physical.

About the fistula itself, it is necessary to know the course and all the branches and ramifications. This may in some cases be satisfactorily determined with a probe; in other cases, injection with an opaque substance (neo-silvol) and a roentgenogram may be needed. On your record commit yourself definitely as to your opinion of the cause of the fistula and its failure to heal; if later you find this opinion to be in error, the experience will be all the more valuable because of the definite record.

REMEDIES INDICATED

The next step in our analysis is to see what the physical modalities will do to remedy the different causes of fistulae and sinuses and of their failure to heal. The following effects, bearing upon fistulae and sinuses, are obtainable from the different modalities:

1. *Antiseptic action*, produced by the following, listed in the order of their value:

- (a) Positive galvanism.
- (b) Ionization of copper, mercury, zinc or silver.
- (c) Ultra violet light.

(d) Diathermy; a sufficient degree of temperature to produce unfavorable conditions for the infecting organism.

2. *Local stimulation.* The same list of modalities as above applies here, with the exception of ionization. The order of their value is difficult to state. In an easily accessible tract, diathermy or ultra violet would be best; in a devious and complex one, galvanism would be better.

3. *Local irritation.* The same list of modalities is applicable. The strength or intensity of the treatment applied determines the degree of irritation, which may reach the degree of complete destruction in diathermy and galvanism.

4. *Astringent action.* This is especially important for the purpose of cutting down the amount and concentration of the discharge from the wound. Positive galvanism and the ionization of copper, zinc and silver are the modalities *ne plus ultra* for this purpose.

5. *Promotion of local nutrition.* If the tract is straight and smooth, the ultra violet light is best; but it is of only secondary usefulness in one that has bends, crypts and branches, as the light acts only on the surface with which it comes into immediate contact, and penetrates practically not at all. If the tract is of such size and shape that a wire electrode can be introduced throughout the whole length, diathermy is applicable. If it has many ramifications into which it is impossible to introduce electrodes and applicators, negative galvanism

is the method of choice; the tract is filled with an electrolyte, which may be normal saline, and which conducts the current to all of the furthest nooks and corners.

6. *Promotion of general nutrition.* For this purpose, the air cooled ultra violet light is of proved value.

TREATMENT

To proceed systematically, the next step is to take up one by one the causes of non-healing and discuss the practical application of the modalities to their relief.

1. *Congenital failure to close of embryonal canals or orifices.* In the more serious cases it is wisest to fall back upon plastic surgery to get rid of the tissue with orificial tendencies, and to secure the maximum cosmetic effect where this is desirable. For tissue destruction, electrocoagulation and electrocautery are often used. In smaller tracts, where the tissues can readily slough out and the resulting hiatus can readily heal, electrocoagulation by the indirect method is the best procedure. The active electrode should be a copper wire that will fit well into the tract; local anesthesia should be used; and the current passed only until the first trace of steam appears at the edges. The wound should receive proper postoperative care, with antiseptic irrigations (mercurochrome, acriflavin, metaphen, neo-silvol); two or three weeks should be allowed for healing; and if by that time it has not yet occurred, it means that not enough tissue has been destroyed, and the operation may be repeated.

2. *The presence of a chronic irritant.* Sequestra and foreign bodies must be removed and pus cavities evacuated. That is what nature is trying, more or less successfully, to do; that is why she leaves an open, non-healing tract from the irritant to the outside. Surgical intervention is usually indicated for this purpose.

3. *The presence of an irritating discharge.* To combat this, we make use of two kinds of methods, antiseptic and astringent. For antiseptics, the ionization of copper, zinc, mercury or silver and the ultra violet light are used. For ionization use weak currents of not more than 10 milliamperes. The positive electrode or anode should be a wire of the same material as the anion or positive ion of the solution; in the case of mercury, an amalgamated copper wire can be used. The solutions of the electrolytes, copper sulphate, zinc sulphate, mercuric chloride and silver nitrate should be weak; not over one part per thousand. Irrigate the tract thoroughly with the solution; then inject a fresh supply of it; and finally introduce the anode wrapped in cotton saturated with the solution. Treatments should be long, a half hour or more. A few minutes' more time will do far more good than a few milliamperes more of current. Usually from half a dozen to a dozen treatments are necessary.

There are several disadvantages to quartz light, in spite of which it remains a very effective agent. The first is that the thin rod applicators apply the rays only to a small spot at the end of the rod. I have been trying to get manufacturers to devise

a rod that will emit rays laterally along its entire length; and have been offered only a little encouragement. In the meanwhile, the difficulty can be overcome by exposing successive spots along the tract with the end of the rod. The second difficulty is that the rays do not penetrate tissue; they act only on the surface with which they come into immediate contact, and not even on the crypts and fissures about the rod. This is overcome in two ways. The first is to produce such a severe secondary reaction that the *reaction* will extend for several millimeters into the issue. The second is to introduce a dye solution into the tract, which will form optical contact between the rod and the tissues, and thus distribute the rays more extensively. Also some work has been done to show the effectiveness of first exposing such dyes as gentian violet, acriflavin and eosin to the action of ultra violet light and then treating the infected area with them.

For pure astringent effect, positive galvanism alone or in connection with ionization of metals as mentioned in a preceding paragraph, is used.

4. *The inability of a cavity to close itself.* The best example of this is a chronic empyema cavity, for which the surgeon removes a rib to permit collapse. The cavity cannot heal until the walls are brought together and kept there. In a fistula or sinus, the separation is seldom due to mechanical factors in the tissues such as obtain in the chest; when it is, plastic surgery is necessary. Usually the separation is kept up by the presence of a wound discharge and of

unhealthy granulation tissue. Methods for handling this have already been mentioned.

5. *Insufficient drainage.* Often this problem can be solved by stopping the discharge, as above mentioned, so that drainage ceases to be a problem. In some cases it suffices to enlarge and straighten the tract by electrocoagulation under local anesthesia, with an ordinary copper wire as the active electrode. In others it is necessary to lay the tract wide open surgically and then follow it up with other methods.

6. *Lack of rest.* When this is due to factors under the control of the patient's will, the remedy is obvious. In some cases pain and irritation produce spasm of the surrounding muscles, the effect of which is the same as that of continuous use of the part. Diathermy and negative galvanism will relax spasm and relieve pain. Often, merely getting through drainage or stopping an irritating discharge will stop the irritation and the resulting spasm.

7. *Specific infection of the walls of the fistula.* When tuberculosis is the cause, the treatment is ultra violet light, positive galvanism and ionization of metals, as outlined in the paragraph about irritating discharges.

8. *Epithelium lining the walls of the tract.* The epithelium must be destroyed. Sometimes ordinary curettment is the most convenient; and again it is not practicable without extensive preliminary cutting, and physical methods are preferable. These consist in positive galvanism and electrocoagulation, under a local anesthetic. For the galvanism use bare copper wire, insert it into the tract, and run a heavy current for

a short time; say 300 milliamperes for three minutes. In this case it is permissible to tear loose the adherent electrode. In electrocoagulation, a wire is similarly inserted and a strong current passed for a short time, say 1,000 milliamperes for two or three seconds. A couple of weeks should be allowed for healing, and the procedure repeated if necessary.

9. *Constitutional debility.* The methods for handling this cannot be fully discussed here, as they embrace all the means at the command of the internist and the physiotherapist. A few items stand out above all others: ultra violet light, arsenic, diet and rest.

The criticism may be offered against this paper that I do not give any practical or specific directions as to just how to go about treating a particular case of fistula. Such a thing would be impossible, unless I could see that particular case. Part of the statistical lack of success in treating fistulae has been due to treating the fistula and neglecting the patient. There are no two fistulae alike, and no two patients alike. Each case is a problem unto itself. If it were possible to give exact directions for procedure, what would be the use of the trained physician? We could supply the directions and the apparatus directly to the patient. I am laying special stress on this point because, compared with other more complicated diseases, a fistula seems such a simple thing to treat. However, the treatment of anything, from a wart to an intra-abdominal inflammation, requires brains primarily and apparatus secondarily.

THE DISCOVERY OF RADIUM*

I have already mentioned that in 1897 Pierre Curie was engaged in working on the growth of crystals. At the beginning of the holidays I had finished a study on the magnetic properties of tempered steel, which had procured for us a small grant

born in September, and as soon as I had recovered I set to work in the laboratory again with the intention of preparing a thesis for a doctor's degree.

Our attention had been attracted by a curious phenomenon observed in 1896 by



Madame Curie.



Pierre Curie.

from the *Société d'encouragement pour l'industrie nationale*. Our daughter Irene was

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In the quiet seclusion of the laboratory, still alive with the spirit of the world-renowned Master, Madame Pierre Curie received us with the charm which is a characteristic of the truly great. As a proof of her interest in the publications of the League, Madame Curie has kindly authorized us to publish in "The World's Health" the following pages which give an account of an event which was to be of great importance to all humanity, the discovery of radium, a "dream come true."¹

Henri Becquerel. The discovery of x rays by Roentgen was at that time arousing a tremendous amount of interest, and various physicists were trying to discover whether similar rays were not emitted by fluorescent bodies, subjected to the action of light. Henri Becquerel was studying uranium salts

¹*Les Grands Hommes de France: Pierre Curie*, by Madame Curie. 1924. Paris. Payot. Pp. 110.

from this point of view, and, as sometimes happens, he came upon a phenomenon different from the one he was looking for: the spontaneous emission by uranium salts of rays of a special character. This was the discovery of radioactivity.²

The phenomenon observed by Becquerel was as follows: a compound of uranium, placed on a photographic plate enveloped in black paper, produced on the plate an impression similar to that which would be produced by light. The impression was due to uranium rays³ passing through the paper. These rays, like x rays, were capable of producing the discharge of an electro-scope⁴ by making the surrounding air a conductor.

Henri Becquerel assured himself that these properties were not dependent on a previous exposure, and that they persisted when the compound of uranium was kept in darkness for several months. The question then arose: whence came the very slight energy released constantly by the compounds of uranium in the form of radiations?

The study of this phenomenon appealed to us as attractive, the more so as there was no bibliography on this entirely new question. I decided to undertake work on the subject.

²Radioactivity is the property possessed by certain bodies of emitting spontaneously a special ray of essentially atomic origin vested with particular properties which cause it to exercise chemical or physical powers, making gases conductors of electricity, affecting photographic plates, causing fluorescence, etc. (Gugnet.)

³Rays emanating from uranium.

⁴Electric measuring apparatus.



The Curie Laboratory Twenty-five Years Ago.

We had to find a suitable place for carrying on our experiments. Pierre Curie obtained authority from the school director to use a ground floor workshop with large windows, which was used as a shop and machine room.

In order to continue Becquerel's experiments, we had to employ an exact quantitative method. The phenomenon which was best adapted to this purpose was the conductivity of the air produced by the uranium rays; this phenomenon, called *ionization*⁵ is also produced by x rays, of which researches had just made known the principal features.

In order to measure the very weak currents which can be made to pass through air ionized by uranium rays, I had at my disposal an excellent method studied and applied by Pierre and Jacques Curie, which consists of balancing on a sensitive electrometer the quantity of electricity brought by the current against that furnished by *quartz piezo-electrique*.⁶ The apparatus consisted of a Curie electrometer, *quartz piezo-electrique* and an ionization chamber.

The latter was formed by a condenser with plates, the upper plate being bound to the electrometer and the lower plate, charged with a known potential, covered with a thin layer of the substance under examination. This apparatus was not very well placed in the crowded and damp spot where we had to put it.

My experiments showed that the radiation of the compounds of uranium can be measured exactly under certain conditions, and that this radiation has an atomic property of the uranium element; its intensity is proportionate to the quantity of uranium contained in a compound, and is dependent neither on the state of the chemical combination, nor on external circumstances, such as light or temperature.

I then undertook to see if there existed other elements possessing the same property and with this in view examined all the elements known at the time, either in the pure state or in the form of compounds. I found

⁵A body is said to be ionized when, under the influence of certain agents (radioactive bodies) an electric current can pass through it.

⁶Electroscope invented by P. and J. Curie to measure radioactivity.



The Curie Institute, Paris.

that among these bodies the compounds of thorium alone emit rays similar to those of uranium. The radiation of thorium has an intensity of the same order as that of uranium, and in the same way constitutes an atomic property of the element.

It then became necessary to find a name to define the new property of matter manifested by the elements uranium and thorium. I proposed the name *radio-activity*, which has been generally adopted since; the radio-active elements have been named radio-elements.⁷

In the course of my researches I had occasion to examine not only simple compounds, salts and oxides, but also a great number of minerals. Certain of these showed themselves radio-active—that is, those which contained uranium and thorium—but their radio-activity seemed abnormal, for it was much stronger than one would have expected in comparison with the results obtained with uranium or thorium.

This anomaly naturally surprised us greatly, and when I was sure that it was not an experimental error it was necessary to find an explanation. I then evolved the hypothesis that the minerals of uranium and thorium contained a small quantity of a substance much more powerfully radio-active than uranium and thorium; this substance could not form part of the known elements, since all these had been examined; it must, therefore, be a new chemical element.

Our absorbing interest was then to verify this hypothesis as quickly as possible. Pierre Curie was so interested in the question

that he left his work on the crystals—temporarily, as he thought—and joined me in the search for the new substance.

The mineral chosen by us was pitchblende, a uranium mineral which in its pure state is about four times more active than uranium oxide.



Madame Curie and Her Daughter in Their Laboratory.

As the composition of this mineral is known by fairly exact chemical analysis, we expected to find at most one per cent of new substance. Our work showed that there actually were new radio-elements in pitchblende, but that their proportion did not reach even one-millionth.

The method we used was a new method of chemical research based on radio-activity. It consists in separating by ordinary chemical analysis and measuring under suitable conditions the radio-activity of all the sep-

⁷This term is synonymous with radioactive dobies.

arate products. In this way one can ascertain the chemical character of the radio-active element sought for; the element is concentrated in portions which become more and more radio-active as the separation progresses. We were soon able to recognize that the radio-activity was concentrated principally in two different chemical fractions, and we were led to distinguish in pitchblende the presence of at least two new radio-elements: polonium and radium.⁸ We announced the existence of polonium in July, 1898, and that of radium in December of the same year.⁹

In spite of this comparatively rapid progress, the work was far from being finished. In our opinion the new elements were undoubtedly there, but in order to have this opinion accepted by the chemists, the elements had to be isolated. Now, in the most strongly radio-active products (several hundred times more active than uranium), there were only traces of polonium and radium; polonium was present in the bismuth extract of pitchblende, and radium in the barium extract of the same mineral. We already knew the methods by which we might expect to separate the polonium from the bismuth and the radium from the barium, but this separation required quantities of raw material considerably greater than those we had treated.

It was at this point in our work that we were greatly handicapped by the lack of adequate means: lack of accommodation, lack of money and lack of assistants. Pitchblende was a costly mineral and we could not buy a sufficient quantity of it. The prin-

cipal source of this mineral at that time was at Saint Joachimsthal (Bohemia), where there was a mine exploited by the Austrian Government for the extraction of uranium. According to our conjectures, all the radium and part of the polonium should be found in the residues of this manufacture. These residues up till then had been of no value.

Thanks to the support of the Academy of Science at Vienna, we were able to procure several tons of the residues on advantageous terms, and we used it as raw material. To meet the expenses of treatment, we had first of all to depend on our own resources; we were later given some grants and received some outside help.

The question of laboratory accommodation was particularly pressing; we did not know where to carry on our chemical processes. We had to set to work in an unused shed, separated by a courtyard from the workshop where our electrometric apparatus was installed. It was a floorless frame barrack, destitute of fittings, with a skylight roof which was not a complete protection against the rain; its furnishing consisted of well-worn tables of pine wood, a cast-iron stove affording insufficient heat, and the blackboard Pierre Curie always liked to use. There were no chimneys for the processes which set free noxious gases; such operations had, therefore, to be carried out in the courtyard when the weather permit-

⁸Uranium, thorium, radium and polonium: These metals are derived the one from the other, by atomic disintegration starting with uranium. The latter gives radium and thorium. Radium in its turn gives rise to numerous other bodies, among which is polonium.

⁹This latter announcement was made jointly with G. Bremont, who collaborated in our experiments.

ted, and otherwise inside with the windows open.

In this home-made laboratory we carried on our labors almost unaided for two years, working together both in the chemical part of our researches and the study of the radiation of the increasingly active substances we obtained. Then our efforts had to be divided: Pierre Curie continued the researches on the properties of radium, while I went on with the chemical processes with the object of preparing pure salts of radium. I would have to treat as much as 20 kilogrammes of material at once, which meant that the shed would be full of bottles of precipitates and liquids; it was very hard work transferring the containers, decanting the liquids and stirring the boiling material in a cast-iron basin with an iron rod. I extracted the radium-bearing barium from the mineral and subjected it to a fractional crystallization in the form of a chloride. The radium accumulated in the less soluble portions, and this process led to the separation of pure radium chloride. The very delicate operations of the last crystallizations were considerably hampered in this ill-adapted laboratory by the iron and coal dust which it was impossible to keep away entirely.

The results obtained after a year showed clearly that it would be easier to separate radium than polonium; that is why we concentrated our efforts on that. The radium salts obtained were subjected to investigations for the purpose of studying their effects. Samples of these salts were lent by

us to various scientists, notably Henri Becquerel.

In the course of 1899 and 1900, Pierre Curie and I published a paper on the discovery of radio-activity caused by radium; another on the effects produced by the rays—luminous effects, chemical effects, etc.; still another on the electric charge carried by certain of the radium rays; finally, a general report on the new radio-active substances and their radiations for the Physics Congress which took place in Paris in 1900. Pierre Curie also published a study on the action of the magnetic field on radium rays.

The work accomplished by us and by several other scientists at this time had the effect mainly of making known the nature of the rays emitted by radium and showing that these rays belong to three different categories. Radium emits a wave of particles moving with great velocity; certain of them bear a positive charge and form *alpha*-rays, others more minute bear a negative charge and form *beta*-rays. These two groups are influenced in their course by the action of a magnet, known now to be a radiation similar to light and to x rays. We were particularly glad to observe that our concentrated radium products were all spontaneously luminous.

The Congress of 1900 gave us an opportunity of demonstrating the new radio-active substances to foreign scientists at first hand. Our discoveries formed one of the main points on which the interest of the Congress was focused.

We were at that time completely absorbed by the new field which our unexpected discovery had opened up to us. In spite of the adverse conditions under which we were working, we were very happy. We passed day after day in the laboratory, taking our simple meals there student fashion. In our bare shed a great sense of well-being reigned; sometimes, while supervising some operation, we would walk to and fro, talking over our work, present and future; if we were cold, a cup of hot tea by the stove would cheer us. We lived in a unique state of preoccupation, as though in a dream.

We used to come back in the evening after dinner to see that all was well in our domain. On tables and shelves were the precious products for which we had no home; on all sides you could distinguish their faintly luminous outlines, and these glimmerings, which seemed suspended in the darkness, never failed to fill us with emotion and delight.

Nominally, Pierre Curie had no claim on the services of the school employees. However, the laboratory assistant who had been at his disposal for his experimental work when he was in charge, still continued to help him in his spare time. This good man, whose name was Petit, was really fond of us; we were helped in many ways by his good-will and the interest he took in our work.

Thus the work on radio-activity began in solitude. But in view of the magnitude of the task, the necessity for help became more and more apparent. In 1898, one of the heads of the school, G. Bemont, collaborated with us for a time. In 1900, Pierre

Curie became connected with a young chemist, Andre Debierne, an assistant of Friedel, who thought a great deal of him. On the proposal of Pierre Curie, Debierne willingly agreed to undertake work on radio-activity; he particularly undertook research work on a new radio-element, the existence of which was suspected in the group of iron and rare earths. He discovered this element, which is named actinium. Although he was working in the physico-chemistry laboratory of the Sorbonne directed by Jean Perrin, he came to see us frequently in our shed, and soon became a very close friend of ours, of Dr. Curie, and later of our children.

About the same time Georges Sagnac, a young physicist engaged in the study of x rays, came frequently to talk over with Pierre Curie the analogies which might be anticipated between these rays, their secondary rays, and the radiation of radio-active bodies. They did some work together on the electric charge carried by these secondary rays.

Outside of the work with our collaborators, we saw very few people at the laboratory; occasional physicists and chemists would come from time to time to see our experiments or to ask Pierre Curie for advice or information, for his authority in several branches of physics was well known. There were many memorable conversations in front of the blackboard, which were a great stimulus to scientific interest and enthusiasm for work, without interrupting our reflections or disturbing the atmosphere of peace and meditation which is the true atmosphere of a laboratory.

NEW EQUIPMENT

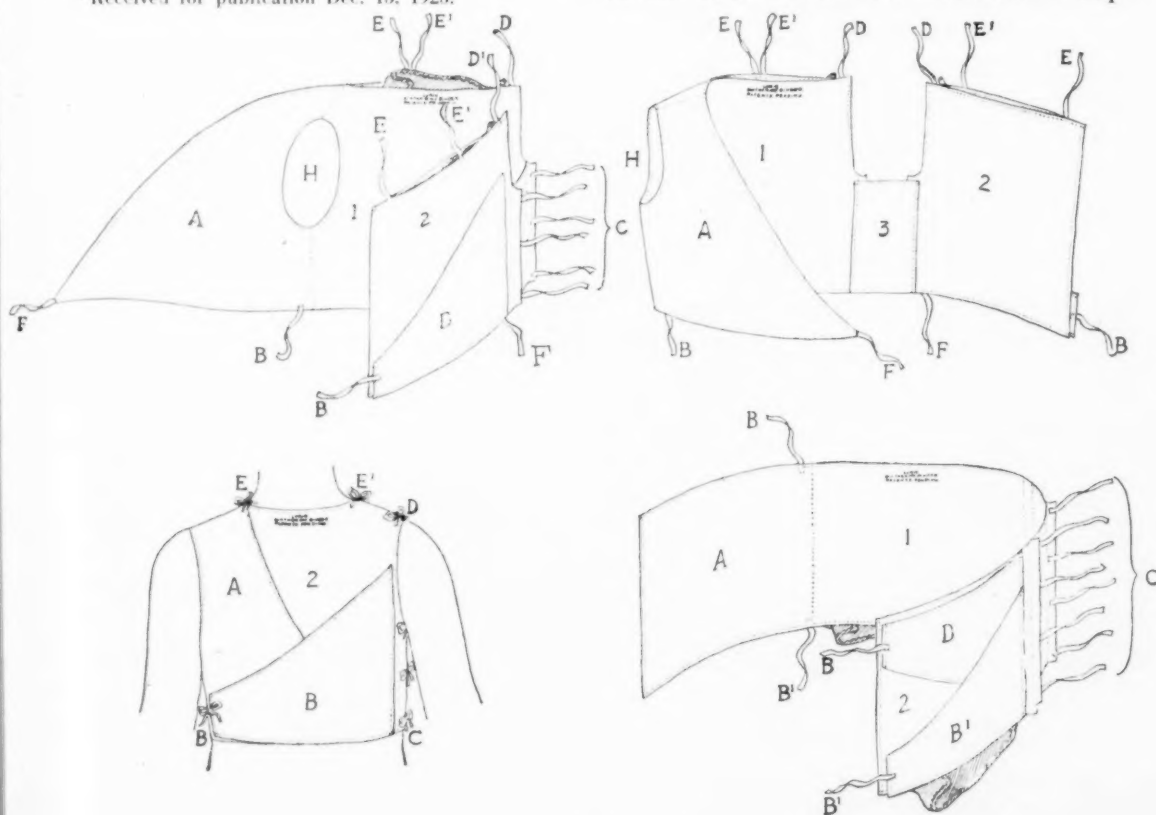
LURIE DIATHERMY BINDER

A New and Interesting Device
(Patents Pending)

AN essential in an effectual treatment with diathermy is the perfection of the contact of the electrodes. This contact must be accurate as to position and must be maintained in the desired position without undue pressure or without restraint. The patient must be made comfortable to remain

quiet for the length of time necessary for a good treatment. For this reason it is rarely possible to give a prolonged treatment to a child, or to an unconscious adult or one unable to be kept quiet, as during pneumonia, because of the danger of the patient moving and breaking the contact. Breaking the contact either causes the electrodes to slip

*Received for publication Dec. 15, 1925.



from their position or reduces the surface contact producing a disagreeable amount of heat at some undesired point, or sometimes a painful burn.

The Lurie Diathermy Binder is constructed to minimize most of the disagreeableness of these treatments about the chest and abdomen, and to overcome the dangers mentioned.

The binder is placed in position over the previously prepared and placed electrodes, and fastened into position. Within the folds of the binder there are two inflatable rubber bags which are so arranged as to be in position on the back and the front of the patient. These are indicated as sections 1 and 2 in the drawings. To make the contact of the electrodes against the skin better and to prevent slipping after fastening the binder, these bags are inflated by means of an air pump. Great inflation is not necessary.

Because of the air in the bags under pressure, its force is exerted equally in every direction and this equality of pressure is maintained over all irregularities of the body surface. The maintaining of an even pressure, sustained in position by an externally applied binder holds the electrodes in a comfortable and stable position, allowing the patient freedom of movement without fear of breaking the contact. The dangers resulting from the slipping of the electrodes is avoided.

The binders are easily applied and easily removed. The air bags are separate from

the cloth portion of the binder and easily removed from one binder and inserted into another (as indicated in drawing), so that if the cloth be soiled it can be readily and inexpensively laundered. The rubber air bags are made removable so that each patient may have their own cloth binder, while one set of bags will suffice for successive patients and treatments.

The construction of the pockets for the air bags is such that the bags can be easily and quickly inserted or removed without fastening or unfastening of any tapes or bindings of any kind. (Attention is directed to the pockets in sections numbered 1 and 2 in the illustrations.) Openings are left in the seam to allow the insertion of the bags, while another smaller open place is left for the bag valve to protrude through. (Note the position of valve in illustrations.) When the binder is applied these valves are in position to one side of the patient, so that inflation can be performed without changing the position of the patient or undue movement on the part of the operator.

The back portion of the binder (No. 1) is the middle section with a bag in it. The inner or body side of the binder is recognized by not having any fastening tapes on it and by being a continuous section, while the outer surface has tapes and flaps on it.

In an abdominal binder its application is effected as follows: The mid-section, or back portion (No. 1) of the binder is placed upon a bed, or cot in an approximate position for the patient to be placed, with the smooth or body side up. On the binder an

electrode with wire contact is placed in position so that the patient will, when placed on the cot or bed, have the electrode in the proper position for treatment, as the kidney, sacral or lumbar area. The second electrode is then placed in the desired position on the opposite side of the body and a secure contact is made with the wire from the machine to this electrode. That portion of the binder (No. 2) containing the second bag is brought over the anterior electrode and then covered with a plain cloth piece (A) attached to the posterior binder section and which folds from the opposite side from that which the second bag was applied. This completes a cloth girdle about the patient. The triangular flaps B and B' with tapes B and B' are fastened across the anterior bag and tied to the two tapes B and B' from the opposite side, at the upper and lower ends. The second set of tapes are brought into view when the plain cloth flap is laid over the second bag. Further tightening and conforming of the binder to body irregularities is effected through the fastening together of the several tapes (C) which will be found at the

side of the patient. The inflation of the bags is the next and final step.

The inflation of the air bags fills in all the irregularities about the body and produces an even pressure on the electrodes.

The application of the shoulder or chest binder is practically the same, except that the right arm and shoulder are put through an arm hole (H). This fixes the position of the posterior segment and bag (No. 1) of the binder, and the anterior flap and bag (No. 2) are carried over in the same manner as described for the abdominal binder. In this binder the cloth flap without bag (A) to complete the girdle is tied to tape F under the flap B in the lower left corner. The single flap (B) from the left side is then tied to a tape (B) on the right side, while the loose tapes (C) under the left arm are then made fast as in the abdominal binder. Before inflation of these bags, the several tapes (D, E and E') over the shoulder and about the neck should be fastened to prevent the binder from slipping from place if the patient should sit up.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

A. R. HOLLENDER, M. D., Editor
ALBERT F. TYLER, M. D., Managing Editor

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PRO OR CON

"You Cannot Be Both For Me and Against Me."

As you strip off the envelope and hurriedly sketch through each monthly publication, only to lay it aside for future pondering, how seriously do you consider the efficacy and extrinsic value of your JOURNAL?

The ARCHIVES OF PHYSICAL THERAPY, chosen as the official publication of the *American College of Physical Therapy*, has a tremendous obligation to fulfill. Monthly it must symbolize to the general medical world the ideals of the organization which it represents. And it is the constant repetition of this symbolic representation that fastens in the minds of the great majority in the field of medicine, a definite

concept of the ideals, activities and practical value of the *College*. For "By His Works Ye Shall Know Him."

As the *American College of Physical Therapy* typifies the medical research, knowledge, art and practice of all physical principles, so should the ARCHIVES propagate, encourage and aid in the development of these concepts. And as the organization and realization of the *College* depends directly upon the coordinated, cooperative work of its individual members, so does the elaboration through its publication of these ideals and this scientific knowledge depend directly upon the unified and organized efforts of its individual supporters.

Many of the subscribers of the *Archives of Physical Therapy* are general practitioners—many of whom are not active members of the society it typifies. Incidentally, we hope to greatly increase this number, for in the last analysis the general practitioner, after he has been able to recognize the pathological condition as it presents itself, recommends the treatment that is to be carried out. And what basis has he for this evaluation with such a hazy, indefinite and inadequate past and present method of teaching of the physical principles? If he does not realize the indications and contra-indications of radiation

and physical methods, if he is to depend for this knowledge of these indications on the miscellaneous material that he reads—not evaluates, for he has no basis for an evaluation—this heterogeneous, superfluous overflow with their contradictory teachings, can do nothing but create a Doubting Thomas or put him clear at sea. Yet we sit back and wonder why our methods are not being practiced nor receiving favor after we fail to present specific, scientific and authoritative knowledge. It is our duty as a radiological publication, the official organ of a recognized medical organization, to assume our share of this responsibility. But the editorial staff of any magazine is only the means to the end. That which is to be presented as typifying the ideals, activities and practical value of our Society, that which is to represent our sympathy and support for scientific medical research, knowledge, art and practice of all physical principles, that which is to stamp us as an integral and indispensable power in the alleviation of human ills, that which is to firmly affiliate us with the art and practice of medicine—in other words, that which appears in the ARCHIVES, rests with YOU.

"You Cannot Be Both For Me and Against Me."

PRO OR CON?

A GLIMPSE INTO THE FUTURE

In the past decade, since the onset of Roentgen's celebrated work with the roentgen ray, Madam Curie's discovery and development of radium, Ling's use of exer-

cise and massage, d'Arsonval's application of electricity and Rollier's demonstration of the physiology of sunlight, much has been written on the various radiological and physical principles. Too much has been written which has been of negligible value. Instead of increasing the evaluation of these therapeutic measures and establishing them as definite accepted therapeutic adjuncts in the obliteration of disease, this superfluous, unauthoritative gossip has turned many observers and readers among the practitioners against radiotherapeutics and physical therapy.

It is the object of the ARCHIVES OF PHYSICAL THERAPY to become a truly educational monthly publication—one which produces and propagates authoritative knowledge.

It is our duty and the duty of every conscientious physician to present the subject as it exists today. By such a procedure the unfamiliar practitioner can familiarize himself with a correct concept of physical therapy and those practicing the science of physical therapy can keep abreast of modern teachings and methods. For the man out in practice, if his large practice does not inhibit his visitation to the larger clinics and educational centers, his finances do. So his greatest source of knowledge should be the medical journals that monthly proclaim the advances made in the medical science.

The ideal journal should be a truly educational monthly publication—one which produces and propagates authoritative

knowledge. It is with the greatest satisfaction that the ARCHIVES OF PHYSICAL THERAPY has the opportunity of presenting to the highest standing who show no hesitancy in presenting their viewpoint on the value of radiological and physical measures.

Beginning with the March issue a short but very instructive symposium has been arranged, on the *Application of Radiology and Physiotherapy to Gynecology*. Frank Benton Block, M. D., of Philadelphia is considering the role of *Radium in Gynecology*, while Robert E. Fricke, M. D., of the Howard A. Kelly Hospital, Baltimore, Md., handles the application of roentgen rays, stressing *Radiation Treatment of Carcinoma of the Cervix*. William L. Clark, M. D., Director of the Clark-Bass Hospital, Philadelphia, is discussing the *Electrothermic Methods in Gynecology*. B. H. Hager, M. D., Urologist, University of Wisconsin, is presenting the applicability of *Diathermy in Gynecology*. Elkin P. Cumberbatch, M. D., Medical Officer in Charge Physical Therapy Department, St. Bartholomew's Hospital, London, has kindly consented to present *The Uses of the Galvanic Current, With Technique*, while in the completion of the subject and its applicability to gynecology, John U. Giesy, M. D., Salt Lake City, has been chosen to consider *Galvanism—Its Availability in Gynecology*. The diagnostic methods in gynecology has been turned over to Earl C. Sage, M. D., Instructor in Obstetrics, University of Nebraska Medical College, who is unquestionably qualified to present *Pneumoperitoneum in Gynecology*.

There is in the process of preparation another real treat in store for the readers. Horace LoGrasso, M. D., Superintendent of the J. N. Adam Memorial Hospital, Perrysburg, N. Y., has begun the preparation of a series of articles elaborating on *Heliotherapy*. To assist in the thorough presentation of this series, W. T. Bovie, Ph.D., Assistant Professor Biophysics, Harvard University, has presented a paper on *The Effect of Sunlight on Growth and Development*; A. Rollier, M. D., Medical Director of the Heliotherapy Establishment, Leysin, Switzerland, has submitted a paper on *Surgical Tuberculosis*; and Roland G. Breuer, M. D., Assistant Physician Kansas State Sanatorium for Tuberculosis, Norton, Kansas, will aid in the presentation.

Many other individual articles have been received for publication, among which appear the names of F. W. Ewerhardt, M. D., Director Department of Physical Therapeutics, Washington University Medical School, St. Louis; Albert Bachem, Ph.D., Professor Biophysics, University of Illinois; Gabriel Tucker, M. D., Chevalier Jackson Clinic, Philadelphia; Disraeli Kobak, M. D., Attending Physiotherapist, Cook County Hospital, Chicago; Gustav Kolischer, M. D., Assistant Professor, Genito-Urinary Diseases, Post Graduate Medical School, Chicago, and many others.

This is only a partial list. But it is sufficient to show that the ARCHIVES is not held to the false notion that men specializing in other branches of medicine or engaged in general practice cannot and do not offer valuable information concerning the

advantages and uses of radiology and physical therapy in diagnosis and therapy. The ARCHIVES recognizes that much of the progress already made in radiology and physical therapy has been achieved by and through the help of just such men.

With the proper cooperation and assistance of our followers such a dependable compendium of authentic and instructive information written for medical men by the best medical authority can be monthly presented.

AIDING IN CANCER RESEARCH

It has been learned that Dr. Francis Carter Wood sailed on December 9th for England, there to study the recent developments on cancer research.

Dr. Wood is certainly qualified for the investigation that he is undertaking. As a pathologist, Dr. Wood has been very active in the study of the cancer problem. As director of the Radio-Therapeutic Department of the St. Luke's Hospital, New York, he has been able to actively carry on the principles that he has presented as director of the Institute of Cancer Research at the Columbia University.

Besides the numerous manuscripts that he has presented the medical profession, Dr. Wood is serving as editor of the *Journal of Cancer Research* and abstract editor on Cancer for the Nelson Loose-Leaf Living Medicine.

Dr. Wood is also an active member of the American Association for Cancer Re-

search and is vice president of the American Society for Control of Cancer.

On the return of Dr. Francis Wood from his investigation in England, we will expect to know authoritatively of the recent developments of the cancer problem

DR. ALVARE ALVIM HONORED

An extraordinary tribute to the radiologist, Dr. Alvare Alvim of Rio de Janeiro, Brazil, has been bestowed by the Brazilian medical profession, represented by the National Academy of Medicine and the Society of Medicine and Surgery of Rio de Janeiro. The Distinguished Medal has been granted in recognition of his sacrifice to his fellow men. Dr. Alvim, having already lost his right hand due to the ravages of radiodermatitis, has recently lost three fingers of his left hand with a questionable benefit in an attempt to check its progress. Such a tribute has not been known to have been previously granted to a radiologist in Brazil.

ANOTHER MARTYR TO SCIENCE

Dr. James A. Day, a practicing physician of Waltham, Massachusetts, a graduate of the Dartmouth Medical School and a pioneer in the use of the x ray in New England, is in the Massachusetts General Hospital—a martyr to science.

Continual exposure of his hands to the same rays, which in moderation have brought relief to hundreds of patients, has led to his suffering. A dermatitis, which

set in six years ago, has slowly progressed, despite a series of six operations. Beginning first in his left hand and necessitating the amputation of three fingers of that hand, the necrosis spread about a month ago to his right hand. Amputation of the right member at the wrist failed to check the progress of the dermatitis, necessitating further amputation on January 3 of the forearm.

While science has learned the value of the moderate use of the ray, it has as yet been unable to adequately obliterate the pathological changes resulting from over-exposure. Slight hope is held for Dr. Day's recovery.

CLARK-BASS HOSPITAL

Sickness has for many months taken Dr. William L. Clark from his duties at the William L. Clark Hospital at Philadelphia; but members of the profession will be pleased to learn that he has sufficiently recovered so as to assume in part his former duties.

During the interim, some valuable additions have been made to the already efficient staff. Dr. H. Hartwell Bass, formerly of Henderson, North Carolina, has actively affiliated with the institution, and will devote his entire scientific talent and ability to the advancement of the healing art.

Another valuable accession was made when Dr. Victor A. Neujean, formerly of the University of Liege, Belgium, assumed the duties of Pathologist and Biochemist.

It has also been announced that the William L. Clark Hospital will henceforth be known as the Clark-Bass Hospital, an institution specializing in neoplastic and allied diseases, together with general laboratory and x ray diagnoses. For the mitigation of human ailments, operative surgery, electro-desiccation, electrocoagulation, electrolysis, radium and x rays will be used.

INTERNATIONAL RADIOLOGICAL COMMITTEE

Official notification has been received from the Secretary-General of the resolutions passed at the first International Congress of Radiology, held last July in London. These resolutions should be of interest to all radiologists who are anxiously assisting and cooperating with every movement that aids in the advancement of our profession.

At the meetings of the delegates held at this Congress, the following resolutions were passed:

1. That this Congress in London is the First International Congress of Radiology.
2. That Mr. Thurston Holland is elected President; and that at the future Congress the delegates shall elect the President on the nomination of the country holding the meeting.
3. That future International Congresses shall be held at intervals of three years, or at such intervals as the delegates at each Congress shall decide.

4. That the next Congress shall be held at Stockholm in 1928, and that Professor Gosta Forsell shall be the President, on the nomination of the delegates from Sweden.

5. That any country having a Radiological Society (or Societies) shall be entitled to send not more than five (common) official delegates to each Congress, but only one vote shall be exercised by each country.

6. That the country in which any Congress is held shall be entirely responsible for all the Congress arrangements, financial and otherwise.

7. That Professor Gosta Forsell be appointed Chairman; Mr. Thurstan Holland, Vice-Chairman, and Dr. Stanley Melville (Secretary-General of the London Meeting), Secretary of the International Delegate Committee until the next meeting of the delegates.

8. That these resolutions shall be forwarded to the Editors of Radiological Journals with a request for their publication.

Signed, on behalf of the International Meeting of Delegates.

C. Thurstan Holland, President.

Stanley Melville, Secretary.

4th July, 1925.

London.

cooperative amalgamating unification designed to standardize the subject of radiology. One step taken in this direction has been overlooked by many.

At the joint meeting of the Physics and Radiology Sections held on Wednesday, July 1st, 1925, it was proposed by Dr. Beclere of Paris and seconded by Dr. Finzi of London that an International Committee be appointed to consider the establishment of an x ray standard of intensity and an x ray unit.

At the subsequent meeting of the Physics Section, the following resolution was put from the Chair: "That in order to give effect to the Resolution passed at the Joint Meeting the British X Ray Unit Committee (which had been formed in Feb., 1923) be requested to communicate with the Physical and Radiological Societies of the principal countries throughout the world, with a view to the nomination by those Societies of representatives to constitute such an International Committee."

Such an action is emphatically necessary. There is no universal standard nor unit today—reports are made based upon sectional or even individual standards and statistics and conclusions drawn from these variable techniques.

X RAY STANDARDIZATION

The International Congress of Radiology held last July in London resulted in the organization of what we hope will become a

PHYSICAL THERAPEUTICS

Word has been received concerning the change in title of the monthly publication of the American Electrotherapeutic Association. Formerly its periodical was known

as the *American Journal of Electrotherapeutics and Radiology*. In the future *Physical Therapeutics* will replace the latter cumbersome title and appear regularly as the official organ of its society.

HONORARY MEMBERS

AMERICAN STOMATOLOGICAL ASSOCIATION

Dr. H. Allaey, Antwerp, Belgium, Secretary-General of the Association Stomatologique Internationale since 1907, and

Professor Dr. Chempret of the St. Louis Hospital of Paris, President of the Association Stomatologique Internationale (A. S. I.), have been elected to honorary membership in the American Stomatological Association at the meeting held in New York City on October 15, 1925. Dr. Allaey and Dr. Chempret have been connected with the stomatological movement in Europe for over a quarter of a century and of such an addition the American Association can feel duly honored.

ABSTRACTS *and* REVIEWS

GASTRO-INTESTINAL SYSTEM

ADENOIDS

Roentgenographic Demonstration of Adenoids. C. C. Grandy, M. D., Am. J. Roentgenol., 14:114-115, August, 1925.

A case is reported of a child suffering from binasal hemianopsia, headaches, some vomiting, double chok discs, with a preliminary diagnosis of tumors of the pituitary gland who was referred to the author for roentgenography. The roentgenogram revealed a normal pituitary fossa, but hanging from the roof and posterior wall of the nasopharynx immediately below the pituitary fossa there was a smooth, semi-oval shaped mass of tissue about $1\frac{1}{4}$ inches long in a vertical direction and $\frac{3}{4}$ inch in a horizontal direction. This mass was uniform in density and extended backward to the bones of the base of the skull and the first cervical vertebra. The diagnosis was made of hypertrophied pharyngeal tonsil or adenoids.

This opens a new field for roentgenography—another means for establishing a diagnosis in lesions of the throat.

MOUTH

Cancer of the Tongue and Mouth. Channing C. Simmons, M. D., Am. J. Roentgenol., 13:545-550, June, 1925.

Cancer of the buccal mucosa is usually one of the most malignant forms of the disease and the large majority of the cases are incurable when first seen by the surgeon.

The mortality of cancer has greatly increased in the last few years and it is probable that any lowering of the mortality of the disease when situated in the mouth will be due more to early diagnosis and prompt radical removal than to any change in the present accepted methods of treatment.

Chronic irritation seems to have a distinct relation to cancer in the mouth. It is surprising to find how many chew, and it is not unusual to find cancer of the cheek on the side on which the quid is held. Tobacco is a decided etiological factor in leukoplakia. Various teeth, pyorrhea and other forms of irritation are etiological factors. Syphilis seems to have a distinct relation to cancer of the mouth.

Pathologically all these growths are squamous cell cancer, but clinically there is the papillary type of relatively low malignancy and slow growth, which forms metastases comparatively late, and a second type, the rapid growing form which metastasizes early and is often incurable inside of six weeks at the onset. But no surgeon should accept a diagnosis of cancer only, but should demand to know the grade of malignancy, the extent of the growth and the possible chances of cure.

Clinically, in the mouth, the malignancy varies somewhat as to position. Carcinoma of the floor of the mouth appears to be the most malignant type; carcinoma of the lower jaw, cheek and upper jaw, relatively less, in the order named. Unlike cancer on the breast, metastases rarely occur beyond the regional lymph nodes on the same side of the body on which the growth is situated. Cross metastases, however, do occasionally occur, as do also remote metastases in the later stages of the disease.

As to treatment. At its inception cancer is a purely local condition and if seen and treated—completely destroyed at this time—the patient can be cured. The local growth can be destroyed by radium, fulguration, diathermy, roentgen rays, etc., and these are the treatments of choice in selected cases, but surgery has cured more cases of cancer than any other one method of treatment, and it is necessary to show good reason for the departure from this method before others are instituted. The operative risk is slight and if necessary a large part of the tongue can be removed under local

anesthesia. The resulting pain and interference with function is much less than one would expect. "I know that most radiologists and many clinicians will not agree with this, but I have yet to be convinced that when an attempt at a radical cure is to be made, surgery followed by radiation is not the best method of treatment.

In a generalized manner the methods of treatment instituted at the Massachusetts General Hospital and the Huntington Hospital may be enumerated:

Routinely, all patients are given a hypodermic injection of morphine one and one-half hours before the operation, which is repeated in one hour, together with atropine. Ether anesthesia is used through a pharyngeal tube. All cases receive post-operative roentgen irradiation of the glandular areas of the neck.

1. In precancerous lesions, intrabuccal excision of the growth and closure of the wound with black silk sutures are used.

2. In very early cancer, intrabuccal excision of the growth and thorough cauterization of the raw areas with actual cautery is practiced.

3. In early carcinoma, intrabuccal incision and cauterization of the local lesion is followed ten days later by a radical dissection of the neck, removing the sternomastoid muscle, the internal jugular vein and all glands from just above the clavicle to the base of the skull. Radium is not implanted into the wound, for there is no place for the seeds except in close proximity to the carotid artery or other vital structures.

4. Early cancer, cases in which the physical condition does not warrant the radical two-stage operation, intrabuccal excision and cauterization of the growth and roentgen treatment of the glandular areas of the neck is undertaken.

5. In more advanced cases of carcinoma with obvious metastases, but in which the growth can be completely removed, intrabuccal excision of the growth is followed with cauterization and roentgen irradiation of the glands of the neck.

6. In inoperable carcinoma, radium treatment is applied to the local growth and roentgen treatment is applied to glands of the neck. The radium should be employed in seeds, capillary glass tubes about 1 by 3 mm. containing one or more millicuries of emanation. From 5 to 10 seeds are used, depending upon the size of the growth.

7. In postoperative recurrences, the same treatment as given in operable cases is used.

STOMACH

Stomach With Two Gas Bubbles: Report of Case. J. Raymond Lutz, B. S., M. D., *Am. J. Roentgenol.*, 13:534-535, June, 1925.

A case is presented which shows a gastro-enterostomy functioning well sixteen years after operation. There is a totally occluded pylorus, which was probably done at the emergency operation for injury sixteen years ago. The patient had a postoperative relief for ten years following the opera-

tion. The complaint now of epigastric distress is divided into two parts functionally, the peristaltic action of both parts moving contents toward a centrally located gastro-enterostomy stoma.

COLON

A Clinical Study of Some Common Anatomical Abnormalities of the Colon: The Low Cecum. John L. Kantor, Ph.D., M. D., *Am. J. Roentgenol.*, 15:207-215, September, 1925.

Low cecum is a common congenital anomaly of the colon occurring in 18 per cent of all patients. This anomaly occurs more often in the persons of the asthenic habitus and is more common in women.

Patients with low ceca show a marked tendency to present certain reflex or toxic symptoms so often termed auto-intoxication. Most of them, about 59 per cent, vomit and may suffer from headaches, 48 per cent. They constitute the easy vomiters or neurotic vomiters of everyday life. The exact nature of this association between low cecum and the symptoms described is not yet clear. Attention is thus invited to the colon as a factor in vomiting—a hitherto insufficiently emphasized concept.

The presence of low cecum can be diagnosed positively only by the roentgen ray. Appendectomy is generally performed, but is seldom of benefit in cases of low cecum. Appropriate, conservative medical treatment gives relief or cure in the great majority of cases.

RESPIRATORY SYSTEM

ROENTGEN DIAGNOSIS

The Uses of the Roentgen Ray in the Diagnosis of Chest Conditions. John E. Livingood, M. D., *Atlantic M. J.*, 28: 447-449, April, 1925.

It is the opinion of the author that one should make use of all his facilities when same are available. One who makes simply a physical examination of the chest when an x ray is available is doing the patient as much injustice as the physician who roentgenographs the patient and disregards his knowledge of physical examination. The clever clinician will check his work with a roentgenogram.

There are also many extraneous conditions which indicate a chest roentgenogram. Whenever one diagnoses malignancy the chest should always be checked, especially malignancies of the breast, thyroid and testicle. The roentgenogram is one of the greatest of instruments in the hands of a trained and experienced operator and interpreter.

A Study of 22 Cases of Lung Abscess. P. S. Winner, M. D., *Illinois M. J.*, 47: 267-274, April, 1925.

Lung abscess is a rather frequent disease and must be differentiated from pulmonary tuberculosis, the x ray being a valuable aid in making the diagnosis. By way of treatment, pneumothorax is a great aid in all cases of lung abscess if started early. The chronic abscess does not respond well to pneumothorax. Here, the author recom-

mends the application of surgical measures. But of all the methods attempted in the treatment—pneumothorax, thoracotomy and drainage, and medical measures—pneumothorax was by far the most satisfactory.

Certain Aspects of Pulmonary Abscess, From an Analysis of 227 Cases. Frederick T. Lord, M. D., *Boston M. & S. J.*, 192:785-791, April 23, 1925.

The author describes five cardinal indications that may aid in the diagnosis of pulmonary abscess.

1. Cough and explosive expectoration immediately leads one to consider the rupture of a pulmonary abscess, empyema, or subdiaphragmatic collection of pus into the bronchi. Explosive expectoration is an infrequent sign of pulmonary abscess.

2. Foul breath and foul sputum seldom occur apart from pulmonary abscess and when present pulmonary abscess should always be suspected.

3. Elastic tissue in the sputum unaccompanied by tubercle bacilli should lead one to consider pulmonary abscess.

4. Dullness on percussion is the most common sign of pulmonary abscess, but need not be definitely circumscribed.

5. Roentgen ray examination, according to the author, is the indispensable method of investigation. "The most characteristic appearance is a roughly circular area of increased density of variable size with mod-

erately well-defined margins surrounding a central rarefied area. If the film is taken with the patient upright or in the lateral prone position a fluid level may often be demonstrated. Fluid level is, however, not always to be seen. If the abscess is full, the entire area of involvement may be evenly dense and the cavity apparent only after evacuation of the contents by cough. Re-examination after complete evacuation may then show, on comparison with earlier films, a central area of diminished density in the region in question. Partial evacuation may show a cavity with fluid level. Some caution may be exercised in the interpretation of the films taken only at one sitting not to mistake a central area of lack of involvement or resolution of an earlier pneumonic process for a cavity."

"Important conclusions regarding operability may be drawn from the radiograms. The site and extent of the process are better defined by roentgen ray than by physical examination. There is a type of diffuse, uneven mottling unsuitable for drainage because of the absence of any abscess of sufficient size to make evacuation desirable. A negative roentgen ray examination does not necessarily exclude abscess which may be obscured by the shadow of the heart or the diaphragm."

"Exploratory puncture of the unopened thorax is unnecessary and dangerous and should be condemned as a diagnostic procedure for the purpose of establishing the presence of a pulmonary abscess."

RADIATION PATHOLOGY

Intrathoracic Changes Induced by Heavy Radiation. Wm. A. Evans, M. D., and T. Leuctia, M. D., *Am. J. Roentgenol.*, 13:203-220, March, 1925.

Intrathoracic changes are observed by the authors wherever a too intensive radiation has been given. The quality of the rays is of no influence. Superficial roentgen ray therapy produces the same intrathoracic changes as deep roentgen ray therapy if the necessary dose is projected within the tissues.

The measurement of the dose within the chest is very difficult because of the different absorption, coefficient values of the intrathoracic structures, such as the lung, heart, pleura, etc. The construction of a special lung phantom is necessary.

The changes produced by the radiation within the chest are of two different types:

1. Early changes manifesting themselves as infiltration, and
2. Late changes appearing as fibrosis.

If a single dose less than 100 per cent S. U. D. is administered over part of the lung or over the entire lungs, no changes will occur which can be observed clinically or roentgenologically.

Infiltration of the intrathoracic structures may appear:

1. If a single dose exceeding 100 per cent S. U. D. is delivered to the lungs. If the dose is lower than 140 per cent S. U. D., the infiltration usually clears up; if it ex-

ceeds 140 per cent S. U. D., fibrosis develops.

2. If a dose of 30 to 40 per cent S. U. D. is repeated over the same part of the lungs at short intervals for long period of time—as sometimes practiced in the technique of superficial roentgen ray therapy. Probably a summation of the effect of the rays takes place.

3. If a dose of 40-100 per cent S. U. D. is repeated several times (three or four times) over the same parts of the lungs at longer intervals (two to six months), as practiced in deep roentgen ray therapy. If at each exposure both lung fields are covered in their entirety, the infiltration produced may have fatal consequences.

4. If a dose of 100-140 per cent S. U. D. is repeated over the lungs for the second time within six months, that is, before the infiltration produced by the first exposure has cleared up, the infiltration due to the second exposure in this case may be so extensive that if the radiation has covered both lung fields an entire loss of function of the lungs with exitus may follow.

Fibrosis of the intrathoracic structures may appear:

1. In the case where a single dose exceeding 100 per cent S. U. D. is delivered to the lungs, if infiltration does not clear up. If the dose is less than 140 per cent S. U. D., fibrosis is seldom observed, but if it exceeds 140 per cent S. U. D. it becomes a routine manifestation.

2. If a dose of 30 to 40 per cent S. U. D. is repeated over the lungs at short intervals for a long period of time, or if a dose of 40-100 per cent is repeated three or four times at three to six month intervals of time, and infiltration does not clear up, fibrosis will result.

3. If a dose of 100-140 per cent S. U. D. is repeated over the same parts of the lungs. If the dose is repeated twice fibrosis will appear in about 80 per cent of the cases. If the dose is repeated three or four times fibrosis will appear in every case.

The prognosis of the radiation infiltration is good. The changes usually flare up without leaving any anatomical or functional disturbance. However, because of the local *minoris resistentiae* created, the patient is susceptible to bronchial or pulmonary infection.

The fibrosis has different prognosis, according to the degree of extension. A slight fibrosis has no inconvenience to the patient, and is only accidentally discovered. A fibrosis extending to one entire lung may produce rather severe symptoms, because of the impairment of the function of such a vital organ. However, the prognosis as to duration of life even here is not unfavorable.

Statistics of 80 patients treated for mammary carcinoma or tumors within the chest are given. These show that, when using adequate technique, fibrosis is rather rare. By further improving the method of treatment this ought to be reduced to practically

nothing. However, in inoperable cases where repetition of large doses is necessary, fibrosis cannot be avoided.

The treatment of intrathoracic changes produced by radiation is purely symptomatic.

TRACHEA

Roentgen Diagnosis of Nonopaque Foreign Bodies in the Trachea. Willis F. Manges, M. D., *Am. J. Roentgenol.*, 13:429-437, May, 1925.

The material for this paper was obtained from the Bronchoscopic Clinic at the Jefferson Hospital. The importance of the diagnosis of foreign bodies in the trachea is realized when one considers the frequency of aspiration of foreign bodies in children and the small percentage that are expelled spontaneously. Any foreign body in the trachea or bronchus that is neither expelled nor removed will cause lung abscess sooner or later. The nonopaque foreign body is more irritating, producing early inflammation and relatively early infection, with its attendant high mortality or invalidism. Usually the first examination results in the diagnosis, but when doubtful cases arise, repeated examinations produce a variety of pictures, due to the change in position of the foreign body, so that the diagnosis can be made by showing these variations without there having been at any time any striking signs.

The author demonstrates a method, on a series of films presented, of marking the films so as to be able to differentiate between films of inspiration and those of ex-

piration, and at the same time to prove the presence of obstructive emphysema of both lungs. The tracheal body that is too small to produce an obstructive emphysema which is recognizable usually gives the most positive physical signs, or lodges in a bronchus—in fact, one of the most dependable findings in physical diagnosis is that the signs vary from day to day or hour to hour.

“To make roentgenographic studies, one must make the exposures so rapidly that even breathing motion will not blur the film. We try to accomplish this in from 1/30 to 1/15 of a second. Intensifying screens should be used. Slight underexposure is better than overexposure, and a moderately short spark gap better than a long spark gap. A rapidly acting time switch is essential not only to obtain short exposures, but also that exposures may be exactly alike. The position of the patient is the same as in roentgenographic study, and we like the tube to be at least 36 inches from the plate. The exposures are made anteroposteriorly, always through the median line, always at exactly the same distance, and as nearly as possible the same film, tube and patient relations.”

BRONCHUS

Roentgen Ray Treatment in Bronchial Asthma and Chronic Bronchitis. Isaac Gerber, M. D., *J. A. M. A.*, 85:1026-1029, Oct. 3, 1925.

In many of the cases of true bronchial asthma, although the anaphylaxis or parietular type of protein sensitization has

been proven, the removal of these extrinsic or intrinsic causes has been done without obliteration of the troublesome symptoms. It is in these cases not responding to specific therapy that the roentgen ray has become of particular value. After a careful computation of the type and extent of treatment to be instituted, there is a lessening and commonly a disappearance of the symptoms: there is a decrease in the number and severity of the paroxysms and cough, a change in the amount and character of the sputum, and a diminution in the abnormal microscopical elements in the sputum.

Two types of treatment with the roentgen ray have been used. The direct method is the application of the rays directly to the thorax and its contained organs. The action is thought to be constricting in nature, shrinking the enlarged tracheobronchial and mediastinal lymph glands, with a subsequent diminution in the irritability of the local fibers of the vagus nerve. The indirect method constitutes the exposure of the spleen, the beneficial result probably being due to the disturbance in the balance of the endocrine system. The improvement obtained seemed to run parallel with the severity of the secondary roentgen ray reactions: nausea, vomiting, headache, temperature rise, etc.

A combination of these two methods is used by the writer. Rays of short wave length are used, 170 or 200 kilovolts, 0.5 mm. copper with 1 mm. aluminum filter, 50 cm. target skin distance. The dosage

administered is from 10 to 15 per cent skin erythema dose. An area about eight inches square over the front of the mediastinum and another over the back will include the main bronchial subdivisions. A similar area is treated over the spleen. The three fields are treated on three separate days, with preferably a day's rest after each exposure. The course of treatment is repeated, if necessary, in three or four weeks.

Chronic bronchitis with asthmatic attacks, or chronic bronchiectasis, not surgical in nature, have received benefit by this method of treatment.

Further Observations on the Roentgen Diagnosis of Bronchiectasis. Alexander B. Moore, M. D., and William J. Marquis, M. D., *Am. J. Roentgenol.*, 13: 527-529, June, 1925.

The symptoms of bronchiectasis are commonly extremely indefinite. The diseased respiratory tract of the bronchiectatic patient renders him a poor surgical risk. It is therefore essential that a diagnosis be established before any operative measures are seriously considered.

The roentgen ray will discover and localize bronchial lesions in many unsuspected cases. There is no other diagnostic agent that can so accurately define the lesion.

Roentgenologically and pathologically these cases of bronchiectasis exhibit three fairly distinct stages, or types. The linear type represents the earliest stage of the condition and is characterized by an increase in the linear markings along the terminal bronchi, is usually localized and is most

commonly seen in the lower lobes. This is undoubtedly the rarest type seen, for the patients present themselves for examination less frequent in the incipient stage of this disease as in all other conditions. The cylindrical type represents the second stage of the disease and is characterized by a more marked increase in the density along the course of the bronchi, the density being now fan-shaped in appearance and interspersed with clear areas. The latter areas represent the dilated bronchioles and have the appearance of cavities. They vary greatly in size and number, and can usually be brought out more distinctly by having the patient empty the respiratory tract of its secretions by postural drainage, and forced respiratory expulsion. This is the most common type observed. The third, or sacculated type, represents the most advanced stage of the disease and is characterized roentgenologically by large pseudo-cavitations and a marked increase in the fibrous elements of the pleura. Occasionally the pleural thickenings are so marked as to simulate a chronic empyema. These roentgenological changes may be more pronounced by having the patient lie on the affected side, changing the angle of exposures and a comparison in this manner; or by draining the cavity and examining.

In this manner the roentgen ray is of extreme value in reaching a decision as to the course of treatment, whether medical or surgical, and in giving a prognosis.

LOBES

Atypical Occurrence of Physical Signs in a Case of Lobar Pneumonia. John Howell West, M. D., *Atlantic M. J.*, 28:373-376, March, 1925.

X ray is frequently a valuable aid in the diagnosis of lobar pneumonia. Early x ray examinations made before the onset of the physical signs frequently showed a triangular shadow with the base at the outside of the lung and the apex extending toward the hilus. When the shadow reaches the hilus, physical signs are found. For this reason alone, the x ray is therefore one of the most valuable aids in the diagnosis of pneumonia.

Roentgenography of Hydatid Cysts of the Lung. Carlos Heuser, M. D., *Am. J. Roentgenol.*, 13:529-533, June, 1925.

Hydatid cyst may occur in any portion of the lungs. Roentgenologically pulmonary cysts appear as a rounded shadow with clear-cut borders with concavity toward the mid-line. If the border is rough and irregular, the diagnosis of cyst must be doubted.

As to the etiological factor, nothing definite can be given. In Buenos Aires, from whence the author writes, pulmonary cysts are seen with equal frequency in men, women and children. They are as frequent on the left as on the right side, and they occur with equal frequency in the country and in the city. Little can be offered as possible etiological causes.

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